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ROADS AND STREETS

AUGUST 1942

Gar Wood Scrapers hauled by Allis-Chalmers HD14 Tractors working near Magnolia, Iowa. Both machines Timken Bearing Equipped.

Shorten the road to Victory--extend post-victory opportunity. Redesign your equipment to include more Timken Bearings.

Every additional Timken Bearing you put in your road building machines means extra speed, extra endurance, extra economy. These qualities are needed in fullest measure to help bring Victory closer and to enable construction contractors to hold their own under the competitive conditions that probably will succeed Victory.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

ADAMS EQUIPMENT HELPS BUILD BOMBING RANGES . . .

Army Air Corps fighter planes in advance of bombing squadrons locate an "enemy" camouflaged anti-aircraft battery during battle practice on a western bombing range.

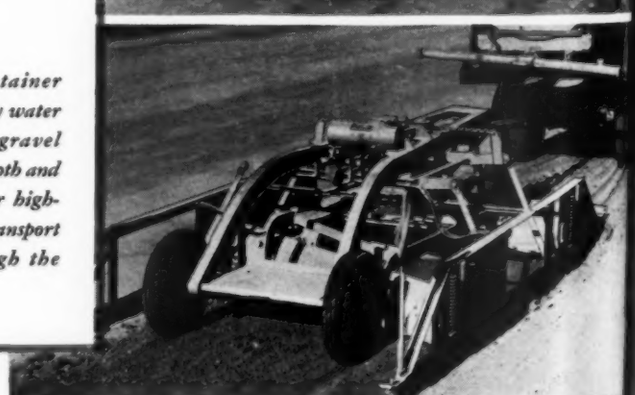
The accuracy of American bombardiers and pilots in smashing axis targets is the result of intensive and painstaking training . . . To provide adequate instruction and practice facilities for bomber crews the Army Air Corps maintains tremendous acreages in isolated areas for use as bombing ranges . . . In the construction of these ranges Adams equipment plays an important part—motor graders do rough and fine grading on runways of adjoining airfields and build haul-roads to and through the ranges—maintainers keep roads smooth to allow high-speed operation of motorized equipment . . . The dependability and versatility of Adams machines is helping to speed the construction of urgently needed ground installations for allied flyers throughout the world!

J. D. ADAMS COMPANY • INDIANAPOLIS, INDIANA
Sales and Service throughout the World

Adams heavy-duty motor grader shaping and grading runways in preparation for laying concrete on airfield adjoining new bombing range pictured above.

☆

Adams Maintainer No. 8 pulled by water wagon keeps gravel haul-roads smooth and trouble-free for high-speed motor transport to and through the range.



TO KEEP YOUR EQUIPMENT ROLLING . . .

service and overhaul it regularly. See your nearest Adams dealer for new machines available under priority rating and for repairs and service on your present equipment . . . Wherever you are or wherever you go Adams co-operative service is near at hand.

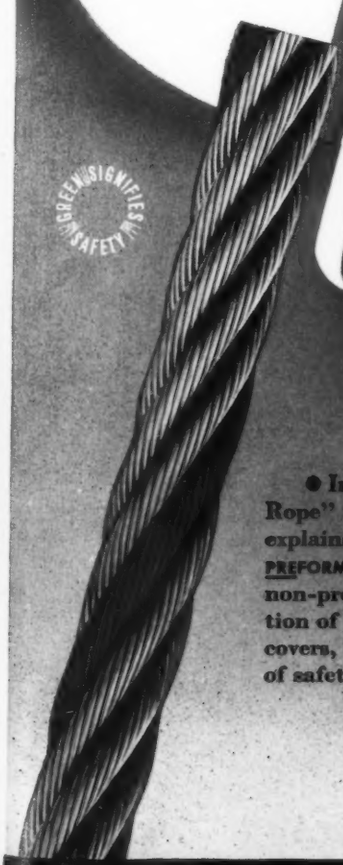
ADAMS

ROAD-BUILDING AND EARTH-MOVING EQUIPMENT

HAZARD LAY·SET *Preformed*

Saves Money - Gains Time - Defends Production

AND
CONSERVES STEEL
FOR THE NATION



MODERN WIRE ROPE DIGEST

not fear will injure them. They handle them with speed and confidence. Such ropes are an aid to production as well as an assurance against costly accidents.

These ropes also afford additional protection for sheaves, drums and other equipment that can be injured by a "porcupined" rope. For example, when a porcupined rope goes over a sheave, the jaggers are crowded back into the rope body where they seriously disturb the construction of the rope and the normal functioning of other wires and strands. Thus the life of the rope is greatly shortened.

PREFORMED Ropes are Quickly Installed

The PREFORMED wire rope saves money for many users by the ease and speed with which it is installed. It is removed from the coil or reel on which it was delivered without danger of kinking. It is more easily and quickly threaded. The first layer winds on the drum uniformly and establishes a secure foundation for the perfect spooling of successive layers. Even when the fleet angle departs from the normal, as it frequently does, it is not nearly as difficult to secure good spooling as in the case of non-preformed rope. To say that it cuts in half the time of reeving and installing is conservative. The savings that count for even more are those secured through reducing the length and frequency of shut-downs — through keeping production going and preventing unnecessary disturbances of schedules on which other equipment is operating.

PREFORMED Ropes are Pre-Broken-In

When a non-preformed wire rope is started to work, right after installation, great care should be taken to break it in slowly, to form it to some extent for the work

PAGE 94

● In its chapter on "Preformed Wire Rope" the MODERN WIRE ROPE DIGEST explains in detail *why* Hazard LAY-SET PREFORMED is superior, in so many ways, to non-preformed rope. Here is a reproduction of page 94 of that book—a page that covers, at least inferentially, the points of safety, faster and easier handling, increased machine production and long rope life. Ask your nearest Hazard representative to tell you about this greater-dollar-value rope. Every Hazard man has inherited 96 years of wire rope-making experience. He is qualified to help you.

HAZARD WIRE ROPE DIVISION

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Fort Worth, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Tacoma

AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT, CONN.

HAZARD LAY·SET *Preformed* WIRE ROPE

ROADS AND STREETS

Vol. 85, No. 8 ▼ August, 1942

CCA

A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; and to the construction and maintenance of airports.

WITH ROADS AND STREETS HAVE BEEN COMBINED GOOD ROADS MAGAZINE AND ENGINEERING & CONTRACTING

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Published by Gillette Publishing Co. Acceptance under the Act of June 5, 1934, authorized January 25, 1938, at Chicago, Illinois. Subscription price $3.00 per year in the United States, $3.60 per year in Canada, $4.00 per year for foreign mailing.

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GILLETTE PUBLISHING COMPANY

330 S. Wells St., Chicago, Ill.
ESTABLISHED 1906

PUBLISHERS OF

ROADS AND STREETS
POWERS' ROAD AND STREET CATALOG
WATER WORKS AND SEWERAGE
CAMINOS Y CALLES
TECHNICAL BOOKS

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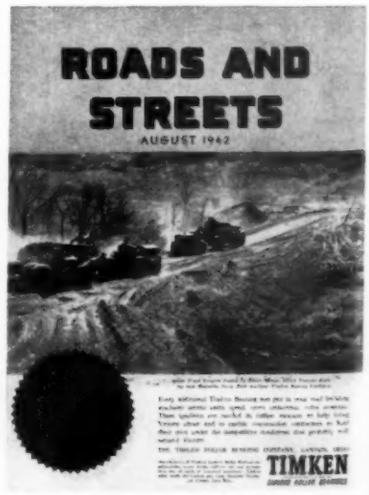
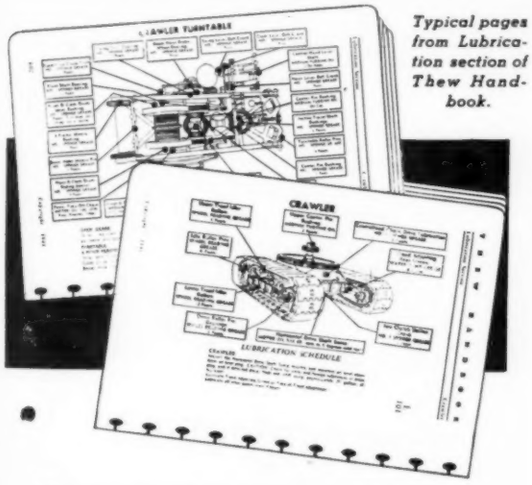


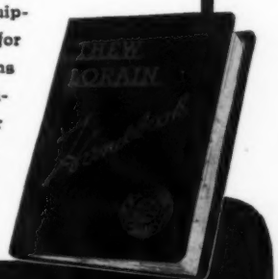
"Gun" your LORAIN- 24 HOURS A DAY

Give it the "Gun" (grease) and add years to the life of your equipment



Typical pages from Lubrication section of Thew Handbook.

All types of equipment need frequent and proper lubrication to prevent damage, delays and expense. One hour set aside in each day's schedule for this purpose will prolong the life and maintain the performance of your equipment. Lorain owners should write today for a copy of the Thew Handbook. It contains diagrams of lubrication points and recommended schedules for *all parts* of your Lorain as well as instructions on operation, adjustment and care. Give Lorain model and serial number when writing.



THEW-LORAIN

CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

But take care of it, too!

It's "all work and no rest" for most Lorain machines these days—tough, round-the-clock jobs that *must* be finished so the next one can be started. Sure, it's a strain on the equipment but Lorains are built with the care and skill that lets them soak up extra work.

So we say, "gun" your Lorain but take care of it, too. A little extra care and service will prolong its life still further and ***help you do more with what you've got.***

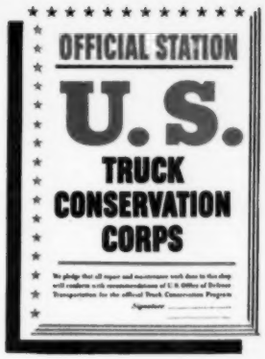
LORAIN headquarters are in the field

There is a Lorain distributor near you who can help make your equipment last longer and work faster. Many distributors carry a representative stock of genuine Thew-Lorain ***factory-made parts.*** They have facilities for ***rebuilding*** machinery and know how to rebuild it properly; they can furnish ***on-the-job field service*** for repairs and replacement; they can serve as a ***clearing house*** for information on rentable equipment or booms you may need for converting present machines. Call on them often.

THE THEW SHOVEL COMPANY, LORAIN, OHIO

Pledged
U.S. TRUCK
CONSERVATION CORPS
OFFICE OF DEFENSE TRANSPORTATION
Sign the Pledge and qualify to display the Official Emblem of the U.S. Truck Conservation Corps on every one of your trucks. Get your emblem — a decalcomania transfer — from your nearest FWD branch or dealer.
FWD

THE ENTIRE NATIONAL ORGANIZATION OF FWD SUPPORTS THE U. S. TRUCK CONSERVATION CORPS CAMPAIGN WITH FULL COOPERATION AND PARTICIPATION



WE are pledged to do our part . . . we are wholeheartedly supporting the Office of Defense Transportation in its job of enlisting the owners and drivers of the nation's 5,000,000 trucks in the U. S. Truck Conservation Corps. Our branches and dealers will cooperate and participate in fullest measure to prolong the life of every existing truck . . . their facilities for periodic servicing are at the command of the nation's truck operators to get the most out of their present equipment . . . to conserve tires — gas — oil — to avoid major replacements.

Motor transport is recognized as indispensable in helping "to speed the flow and movement of farm, military and industrial products so necessary to victory." Wartime conditions have emphasized the value of keeping good trucks in sound condition . . . making them last and getting the most wear out of tires.

Building trucks that will "haul longer for less" is a tradition with the FWD organization. Many FWD's, manufactured twenty-five years ago, are still providing dependable transportation. Thousands of FWD owners regard their FWD trucks as "priceless" today when soundly-built motor trucks are so vital.

If you are not familiar with the plan of the U. S. Truck Conservation Corps — write us for full information.

THE FWD MODEL HG ALL-SEASON MAINTAINER TRUCK Conserves Equipment...Time...Manpower

ONE UNIT DOES 61 ROAD MAINTENANCE JOBS

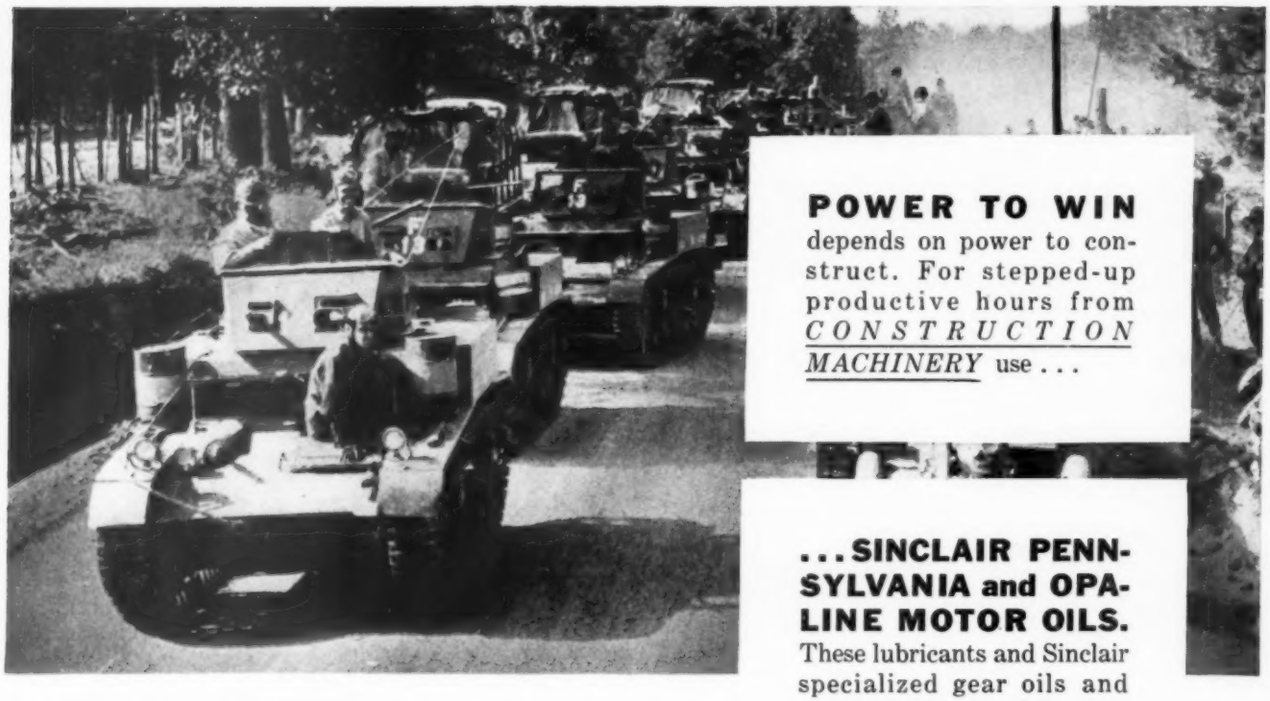
While economies in other public works may be necessary—the conditioning and maintaining of the nation's arterial and feeder roads is essential to the war effort and cannot be neglected without jeopardy to a basic means of transportation.

All of 61 road maintenance jobs can be done better — faster — with greatest economy and conservation of gas — oil — tires — maintenance — by one unit — the FWD Model HG All-Season Maintainer Truck. Highway officials report that the all-around ability of this powerful, versatile maintenance truck — built with traditional four-wheel-drive ruggedness and capacity to haul longer for less — stands them in good stead now . . . solves many a problem . . . with manpower scarce and road-working equipment hard to get.

Even though FWD manufacturing facilities are in night-and-day operation satisfying military and priority purchaser demands, a limited number of FWD trucks are available under the rationing regulations. Write today—get full information.

FWD
TRUCKS

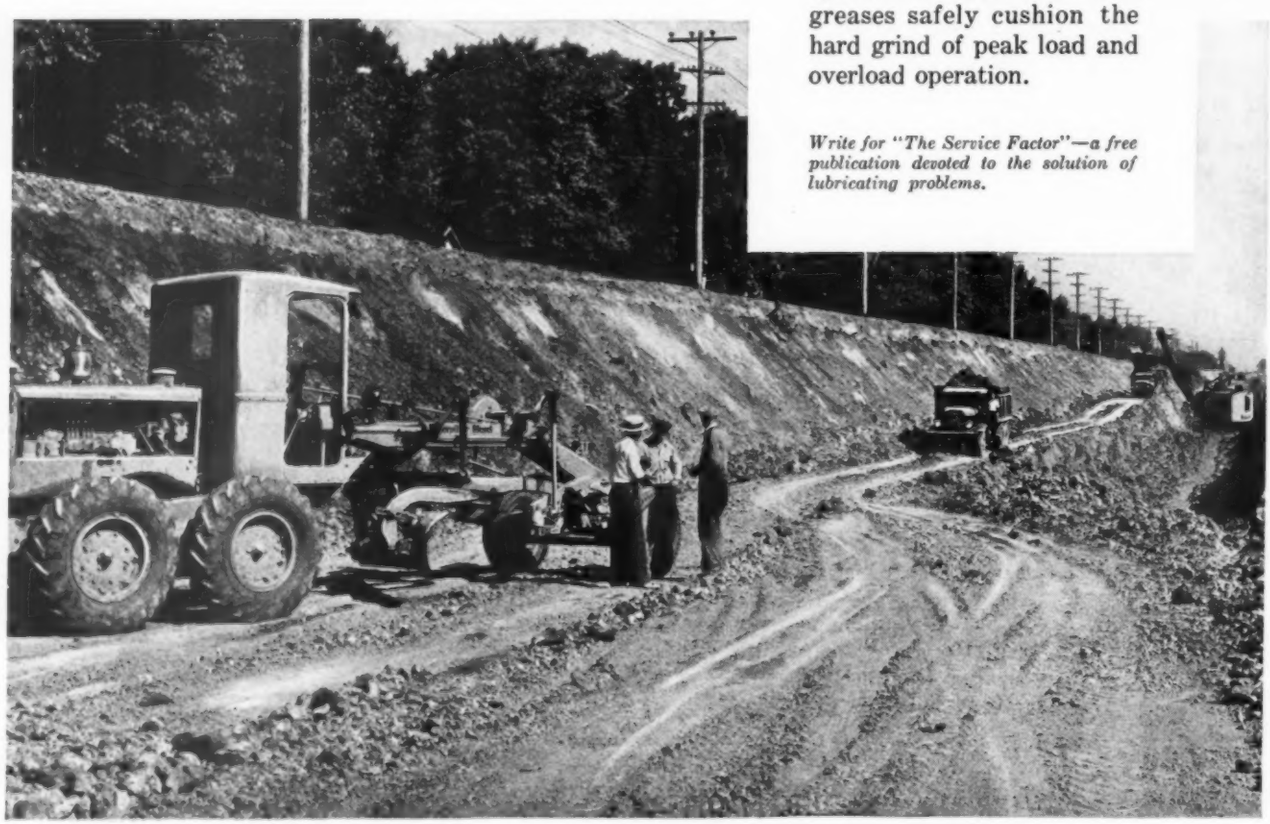
THE FOUR WHEEL DRIVE AUTO CO.
Clintonville, Wis., U. S. A.
***Canadian Factory:* KITCHENER, ONTARIO**



POWER TO WIN depends on power to construct. For stepped-up productive hours from *CONSTRUCTION MACHINERY* use . . .

. . . SINCLAIR PENNSYLVANIA and OPALINE MOTOR OILS. These lubricants and Sinclair specialized gear oils and greases safely cushion the hard grind of peak load and overload operation.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



SINCLAIR LUBRICANTS-FUELS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE NEAREST SINCLAIR OFFICE

SINCLAIR REFINING COMPANY (Inc.)

2540 West Cermak Road, Chicago • 10 West 51st Street, New York City • Rialto Bldg., Kansas City • 573 West Peachtree Street, Atlanta • Fair Building, Ft. Worth

Keep it well serviced and it will keep on serving you well

CARE, OPERATION, ADJUSTMENT

Fuel, Oil—Store in clean, covered containers.

Air, Fuel Cleaners—Clean them regularly.

Tracks—Adjust slack and tension for best work.

Nuts, Bolts—Go over them frequently; keep them tightened.

Oil Screens—Clean regularly, replace filler element as instructed in operator's manual.

Steering Clutch Levers, Steering Brake Pedals—Adjust to suit operator.

Read, study your operator's manual for other money-saving suggestions.

MAINTENANCE

Unit Replacement—Saves time. **Sleeves, Pistons**—Replace when needed—quickly, easily.

Crankshaft Bearings—Replace when needed; no fitting or reaming necessary.

Transmission—Inspect and adjust regularly.

Transmission Bearings—Replace when wear occurs (this eliminates other expensive replacements).

Steering Clutches, Brakes—Inspect and adjust regularly; replace as needed. Clutches and brakes can be removed without disturbing bevel gears, sprocket drive gears and shafts, track frames, or track rollers. Adjustment of either clutches or brakes can be done independently of the other.

SERVICE Will Back You ... Come What May!

THESE are days of *pressure* for men and machines. There's important work to do and it must be done fast! When the hours are long and the job is tough, the built-in quality of your equipment is bound to show up. Under such conditions International TracTracTor owners are getting daily proof of the fact that these big Diesel crawlers can take punishment and keep coming back for more. The man behind the controls of a TracTracTor knows he can count on his machine no matter what the job—if SERVICE, too, is on the job!

It is SERVICE that is of *paramount* importance today!

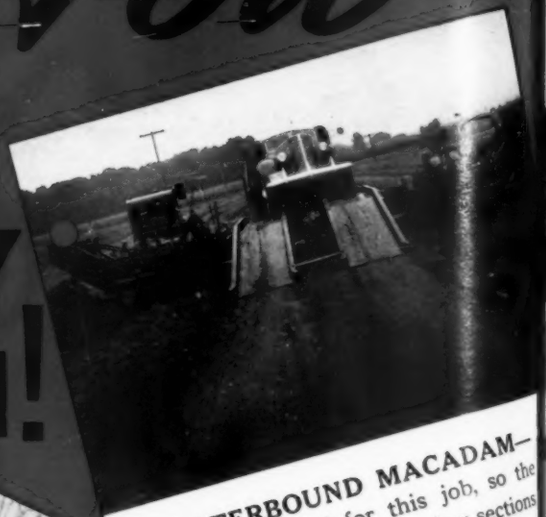
Up-to-date service departments, precision replacement parts, and skilled mechanics enable the International Industrial Power dealer —from coast to coast—to give you the kind of attention you need for best efficiency from your TracTracTor, Wheel Tractor, or Power Unit. Keep in touch with your International dealer. His shop is your "home base" for the best service you can possibly give to your equipment.

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue — Chicago, Illinois

INTERNATIONAL Industrial Power

Here's How to SPEED ROAD and RUNWAY CONSTRUCTION!

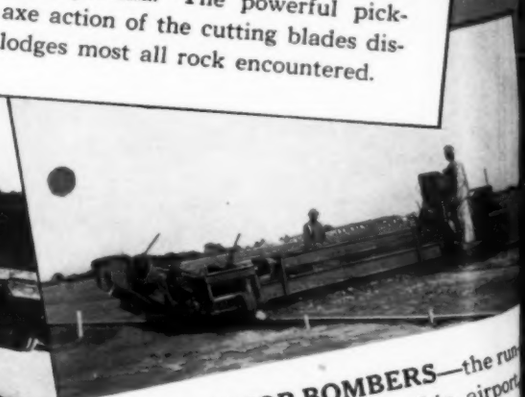


WATERBOUND MACADAM—no forms used for this job, so the Finegrader moves on a few sections of low, light weight forms which are picked up and placed ahead of the machines as it progresses.

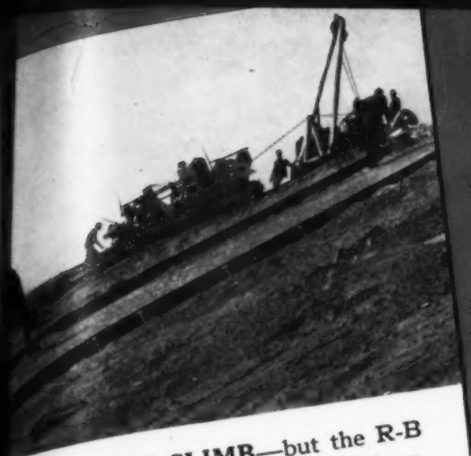
ROCKY RIDING — but that doesn't stop this Buckeye R-B machine on half width construction in Pennsylvania. The powerful pick-axe action of the cutting blades dislodges most all rock encountered.

SETTING THE PACE AT AN ARMY POST — this 24 ft. Finegrader set the pace for two single drum 34-E pavers to rush 19 miles of roads to completion on a huge military reservation expansion project in the State of Kentucky.

HIGHBALLING A HIGHWAY —with a clean, smooth, accurate grade way out ahead of the paver. Note that the rough grading can be left plenty rough to save time and money. This job is in Pennsylvania.

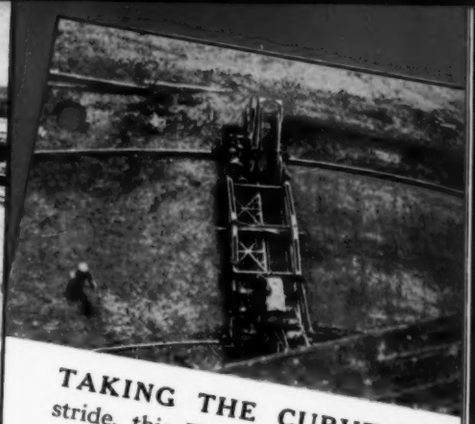


BUILT FOR BOMBERS—the run way construction on this airport equivalent to 63 miles of 20 ft. road, was rushed to completion in 42 days by 4 dual drum pavers and 4 Buckeye R-B Finegraders, one ahead of each paver. No modern paving outfit is complete without an R-B.

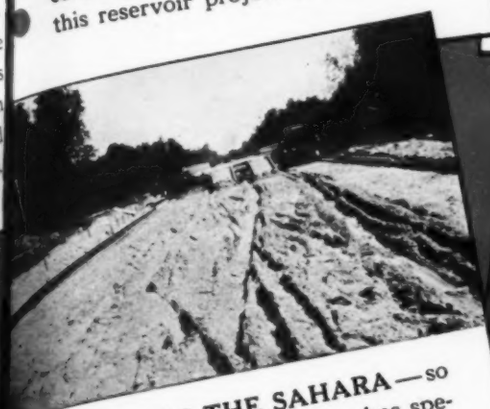


A TOUGH CLIMB—but the R-B Power Finegrader, on a 3:1 slope, left an "almost perfect subgrade" according to the Superintendent on this reservoir project in Nebraska.

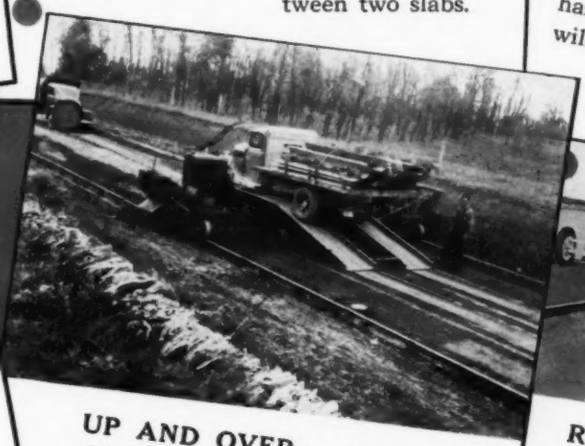
RIDING ON THE SLAB — with rubber-tired wheels. Note auxiliary discharge conveyor to throw dirt out over the berm. You can run Buckeye R-B Finegraders between forms, between a form and a slab or between two slabs.



TAKING THE CURVES — in stride, this Finegrader is operating around a circle of 125 ft. radius just as efficiently as on the straightaway. A Buckeye R-B Finegrader will handle virtually any condition you will encounter on a paving job.



SANDY AS THE SAHARA — so this R-B Power Finegrader has special skid shoes to support the cross-over bridge. Sand, clay, shale, gumbo—there isn't a job short of solid rock that you can't handle with a Buckeye R-B Finegrader. This machine is working in Michigan.



UP AND OVER — where trucks ride on the grade, cross-over bridges can be supplied with R-B Finegraders. Weight of the bridge and truck is supported by wheels on the bridge —no load placed on the Finegrader or on the forms.

RUNWAYS ARE ROADS—and Buckeye R-B Finegraders are working on airports from coast to coast. "Finegrader working 10 hours a day, seven days a week, ahead of one single drum 34-E and one dual drum 34-E paver putting down 350 feet per hour"—that's typical of reports coming in from users everywhere.

BUCKEYE R-B Power Finegraders are pace setters on any paving job. They keep the grade way out ahead of the paving crew—even where two 34-E pavers are used there's no delay. They save manpower by eliminating practically all hand labor on the grade and they're one-man operated. They cut the grade to exact cross section, eliminating the excessive loss of yield and time that comes with extra slab thickness. They put the spoil to the side where it is easy to handle for building shoulders or grading. They're easily moved from job to job and they require a minimum of maintenance.

If you want to see your output go up and your costs go down, get your job rolling behind Buckeye R-B Finegraders. They'll give you speed and more speed on today's vitally needed roads and runways. Write today for complete information and literature.

BUCKEYE TRACTION DITCHER COMPANY
Findlay • Ohio

Built by Buckeye

NEXT WINTER'S BLIZZARD is *Today's* problem

. . . order WALTER SNOW FIGHTERS now!

When the blizzard strikes next winter, will you be caught "too late", with "too little" snow removal equipment? It will be more vital than ever to prevent blocking transportation of war products, troops, guns, tanks and supplies.

NOW is the time for highway officials to prepare. Equip with WALTER SNOW FIGHTERS and be ready for winter's worst! The exclusive Four-Point Positive Drive provides FOUR powerful driving wheels with positive traction in each, to blast through the deepest drifts—to travel icy surfaces—to keep going when other trucks give up.

Don't wait for the first snow. Study your needs NOW. Write today for full facts on Walter Snow Fighters.

WALTER MOTOR TRUCK CO.

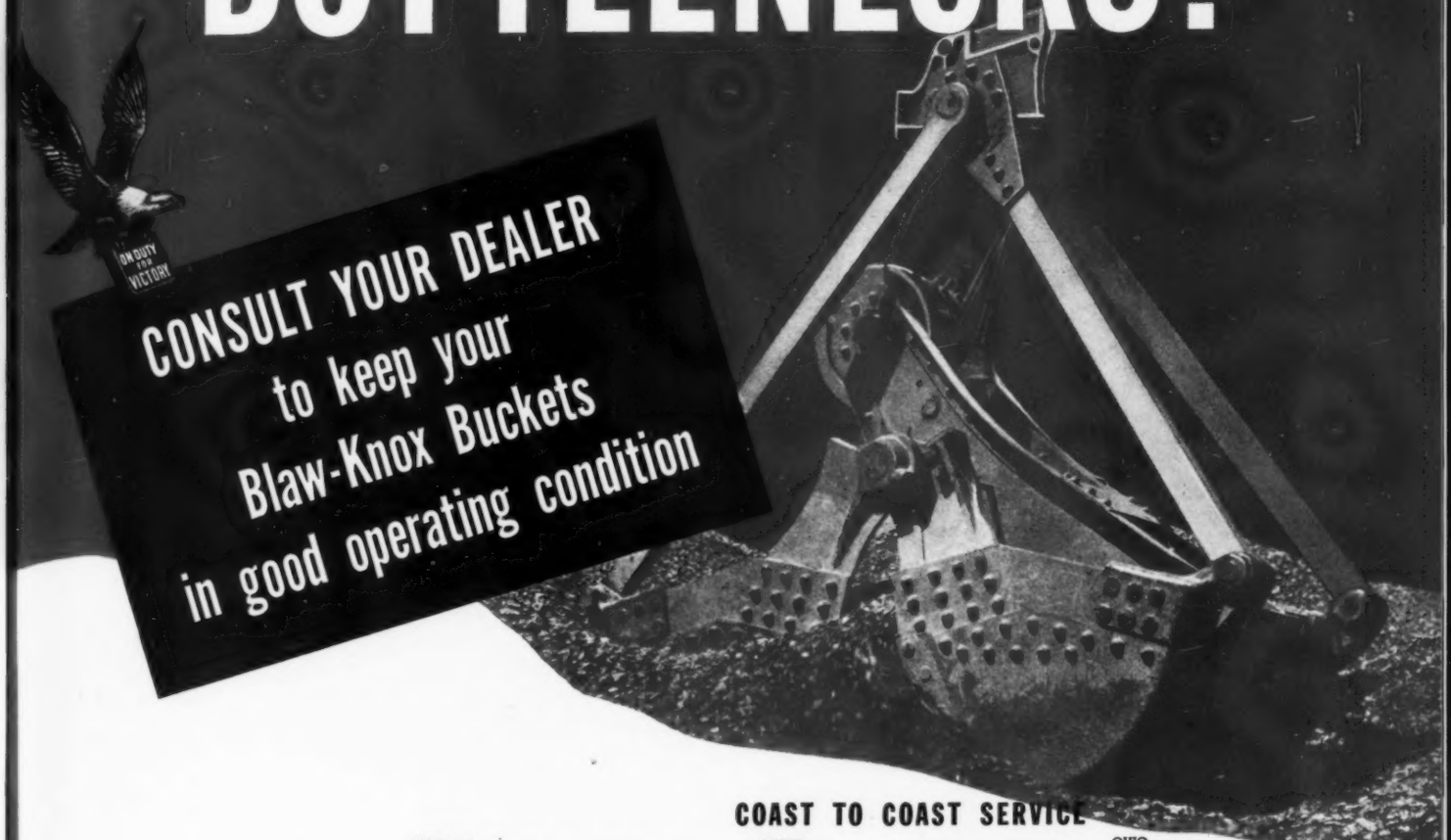
1001-19 Irving Ave., Ridgewood, Queens, L. I., N. Y.

Above: Walter Snow Fighter on night duty, clearing Pennsylvania Highway.

• • •

Below: A few of the 40 Walter Snow Fighters serving State of Oregon.

BUCKETS CAN BE BOTTLENECKS!



eep your buckets han-
ing more material—
oing more digging.
our nearby Blaw-Knox
ealer is trained to
agnose bucket ills. Let
m inspect yours today!
e life of your bucket
n be prolonged.

COAST TO COAST SERVICE

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Dallas ..... Conley-Lott-Nichols Machinery Co.
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BLAW-KNOX

BLAW-KNOX DIVISION OF BLAW-KNOX COMPANY
Farmers Bank Building
PITTSBURGH, PA.

★ Throughout the country, and in the islands that now form the outposts of American defense, Cleveland rock drills are doing their important part in the building of roads, air bases, gun implacements, and fortifications. These projects are vital to the system by which we shall protect ourselves until barbarous Axis nations are finally disarmed and forced back within their own borders. The work must be done well, and with dispatch, so it is fitting that Cleveland rock drills are constantly being called upon to do their part in the nation's big job. Drills for this work must operate in extremes of weather conditions, from the frigid climate of Greenland to the hot and humid weather of the South Sea Islands. They must be fast, reliable, and rugged. Our armed forces know they can depend on Cleveland Hand Sinkers, Paving Breakers, Tampers, Diggers, Wagon Drills — *and so can you!* We will place Cleveland Drills on your job on a trial basis. Simply tell us the type and size, or write us about your drilling conditions.

May we send a catalog?

BRANCH OFFICES

Birmingham, Ala.	Dallas, Texas	Philadelphia, Pa.
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CANADIAN DISTRIBUTORS

Purves E. Ritchie & Son, Ltd., 658 Hornby St., Vancouver, B. C.; Whitehall Machine & Tools, Ltd., Galt, Ontario

DID YOU GET YOUR COPY OF THE DRILLER'S HANDBOOK?

It is chock full of hints that will help you get more work out of your air tools, and that will enable you to make them last longer. Write stating the sizes and types of rock drills you are now operating, and a copy will be sent postpaid without charge.

THE CLEVELAND ROCK DRILL COMPANY

Cable Address: ROCKDRILL • CLEVELAND, OHIO

LEADERS IN DRILLING EQUIPMENT

Continuous Mixing

Why did Barber-Greene build a continuous mixer instead of the conventional intermittent batch type? The answer is in the diagram of the Barber-Greene shown above. At the upper left, the graded, and accurately measured aggregate continuously enters the pugmill in a small stream. In entering, it falls through the spray chamber where it is continuously sprayed with a small stream of metered bitumen. The combining process has started, even before the materials enter the pugmill. The need for preliminary dry mixing is completely eliminated. The Barber-Greene does not have to undo the segregation caused by dumping batches into the mill. In fact a cross section of the mix extracted just a few inches beyond the charging end of the pugmill contains the correct amount of each size of aggregate with the correct ratio of bitumen.

Here the propelling and retarding paddles work the material through the pugmill under pressure, using friction to take the excess from the fines and evenly coat the coarse material.

As the mix is constantly worked through (from left to right in diagram) there can be no dead material, even at the very bottom.

The Barber-Greene uses more horse-sense, and less horse-power. It attains complete homogeneity the easiest, most logical way. It has not only established new standards for accuracy and uniformity, — but has changed moving and erection from a major project to a simple low-cost maneuver. Barber-Greene Company, Aurora, Illinois. 42-1

BARBER BG GREENE

Steel
TO KEEP W

scrap

needed – now

The steel industry is in urgent need of iron and steel scrap to keep the mills operating to capacity —to keep war materials moving steadily to American fighting forces and to our Allies.

Scrap is required in enormous quantities in the production of new steel. A constant flow to the steel mills must be maintained *now* in order to prevent the slackening off of operations and a drop in production.

It is of vital importance to everyone to see that all iron and steel scrap is salvaged and sent on its way to the mills.

Cooperate With the National Scrap Salvage Campaign

A national scrap salvage campaign is now under way and we are appealing to users of iron and steel equipment or material to collect all possible scrap and put it to work for your country.

Contractors in the building trades may have old or worn-out equipment or machines that can be scrapped. In the case of equipment being saved for spare parts—the parts can be removed now and the remainder scrapped.

Anything made of steel or iron is valuable as scrap—old wheelbarrows, shovels, old pipe, discarded furnace castings, old roofing, worn-out ductwork, old radiators, old tanks, worn-out hardware. Comb your equipment yards and storage sheds for such material.

★ ★ ★ ★ ★ ★

This appeal is made on behalf of the national war effort and is not for ourselves alone. All the steel-producing companies need and will need such material. Much of the available scrap is allocated by the Government to be used wherever needed most.

It's the obligation of everyone to do whatever he can to help keep the scrap moving. Sell your iron and steel scrap to a local junk dealer or send it to a collection point. But get it started on its way to the steel mills.

If you have any questions regarding procedure, we suggest that you get in touch with your local Industrial Salvage Committee.

P WAR MATERIALS MOVING BETHLEHEM STEEL ★★★★★★

LET'S DIG IN... and DO THE JOB WITH OWEN BUCKETS

The OWEN BUCKET Co. 6070 BREAKWATER AVE. CLEVELAND, OHIO BRANCHES: New York, Philadelphia, Chicago, Berkeley, Calif.

Cut YOUR MIXING Costs

Modern bituminous mixing equipment is essential in meeting short time limits on many defense projects, but the production of this equipment is necessarily limited.
While this company's facilities are being used entirely in the war effort, a limited number of bituminous plants for defense purposes are available.
WE INVITE YOUR INQUIRIES.

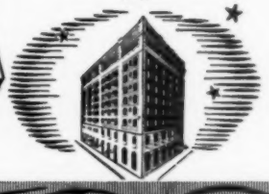
Hetherington & Berner Inc. 701-745 KENTUCKY AVENUE INDIANAPOLIS INDIANA ENGINEERS AND MANUFACTURERS

Stop at the SEELBACH
we'll take care of the REST

You needn't worry about a thing...check in at the Seelbach and you're sure of a good bed, attentive service, fine food and a friendly atmosphere. You'll awaken in the morning refreshed and ready for a successful day.

500 ROOMS WITH BATH from $2.50

VISIT THE PLANTATION AND LAMP ROOM Newest Rendezvous in town



WALNUT AT FOURTH ST.

LOUISVILLE, KY.

Soil Stabilization

By V. J. Brown
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ROADS AND STREETS

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Texas State Highway Department

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Soils Engineer,
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E. S. Barber
Junior Highway Engineer,
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This book is reprinted from a series of articles published in ROADS AND STREETS. Demand for the series was world wide. The book treats of fundamentals of soils mechanics and soil stabilization such that the average engineer can get a complete understanding of this new branch of highway engineering.

Profuse illustrations tell more than words could.

141 pages—Hard binding • Price, $2.00 Plus Postage

GILLETTE PUBLISHING CO., 330 S. WELLS ST. CHICAGO ILL.

FIGHTING TIME
in the BLACK OF NIGHT

THE sun slides down beyond the horizon, blacking out acres that are being transformed into an airfield. Lights flash on, tunneling slick shafts into the darkness, silhouetting hurrying figures and rumbling machines. The roar of engines pounds the air — the runway paving job rolls steadily on into the folds of night. Uncle Sam is working tirelessly around the clock to hasten the day that Victory will be won.

Let's watch a minute. A truck, its headlights stabbing the darkness, hurries across the field with its burden of material, black as the night itself, to the waiting hopper of an Adnun Paver. Watch the black carpet roll out behind the paver, smooth and level and accurate. Low visibility of the work doesn't hamper the operator. His hydraulic controls are banked within easy reach, adjustments are easy to make. He has the feel of the machine and is confident of the work it is doing as it rolls along unerringly, striking off the material to exact cross section. Adnun Continuous Course Correction automatically levels out the surface irregularities. The Cutter Bar Strike-off makes tight, compact joints between parallel courses. The Power Cut-off stops flow of material with no tag end runouts at the end of the course. A 1,000 tons or more of material will go down tonight.

Tomorrow the runways will be nearer done — Uncle Sam will be nearer his goal because Adnun accuracy can be counted on even in the dim of night operations. To win the war now — to meet the competitive situation after the war, you need the speed, accuracy and savings that Adnuns can give you. Talk it over with your Foote dealer or write direct today.

THE FOOTE COMPANY, INC., Nunda, N. Y.

WORLD'S LARGEST EXCLUSIVE BUILDERS OF ROAD PAVERS

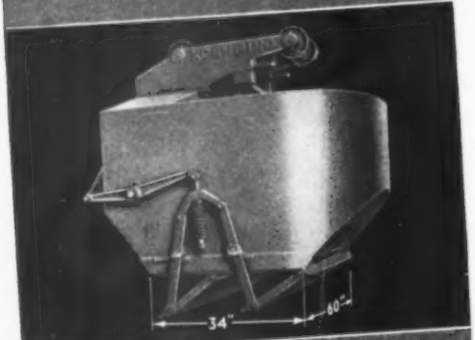
ADNUN

BATCH-CYCLE SPEED CUTS POURING TIME

THESE 3 OPERATIONS REDUCE BATCH-CYCLE TIME . . .

Wide, Flow-Line, Quick Charging Skip Saves Seconds.

Air Controlled Discharge Chute is Positive, Quick Acting.



Twin-Door, Large Opening Bucket Dumps and Spreads at High Speed.

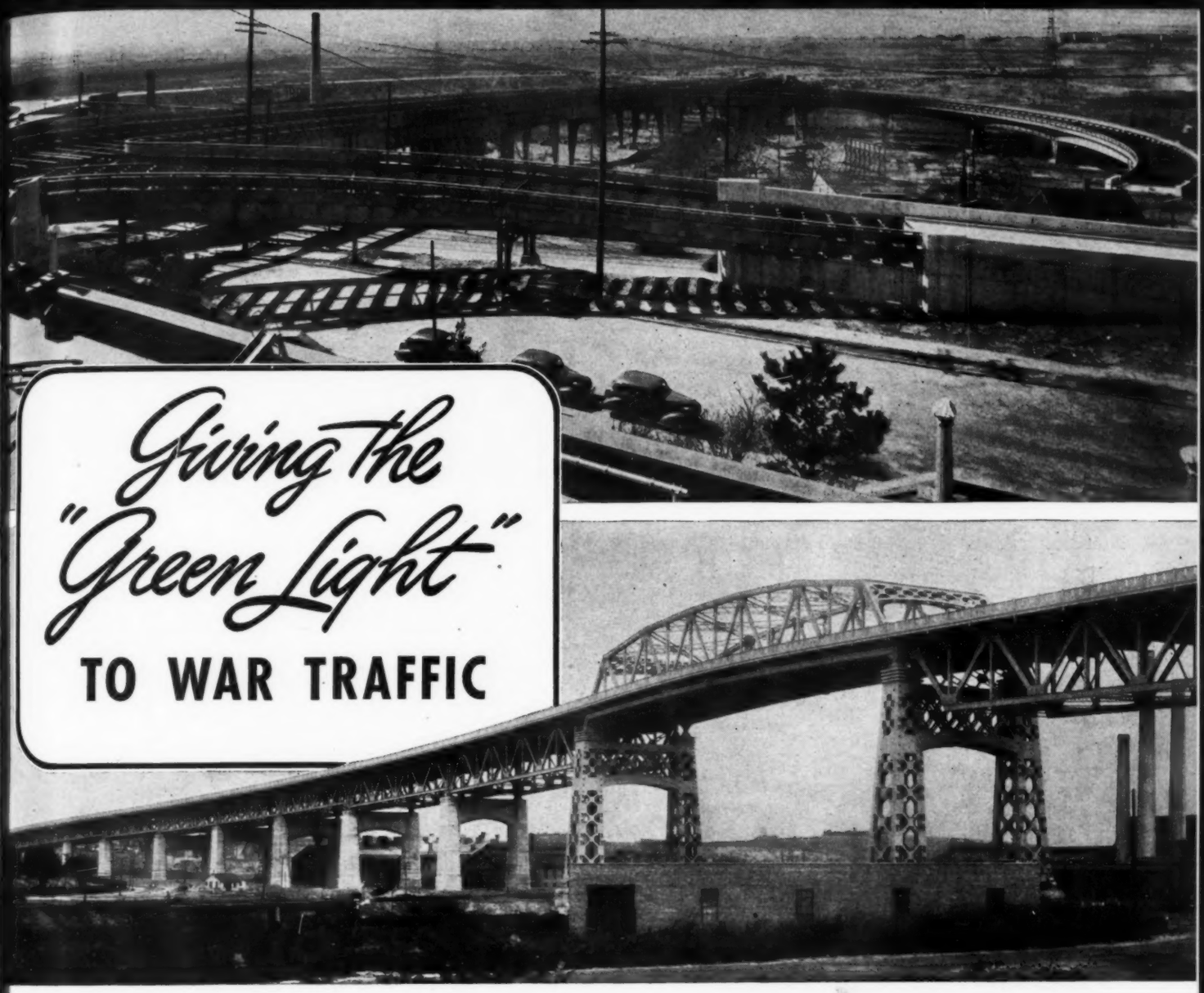
MAXIMUM YARDAGE KEEPS JOB MOVING

... Concrete slab jobs, today . . . airports, military highways and access roads . . . must be poured at top speed . . . men, equipment and materials . . . all striving to one end . . . smooth concrete highways and runways . . . in the shortest possible time. Koehring Paver batch-cycle speed helps meet production schedules. Batch-cycle is controlled by three important operations . . . charging, discharge and spreading. Koehring skip charges drum at high speed . . . drum interior quickly shrinks material . . . twin-door bucket spreads concrete without clogging delay. All operations are accurately and automatically batch-meter timed for maximum production.

KOEHRING COMPANY, *Milwaukee, Wis.*

KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT



Giving the "Green Light" TO WAR TRAFFIC

WHEN production records fall, it's good news. But production alone can't win the kind of war we're fighting. It takes production *plus*—and one important "plus" is swift, efficient transportation. That's why America's modern integrated highway systems are top-notch war assets. They shorten the time between the manufacture of war material and action against the enemy. Numerous American Bridge-built structures are serving this useful function.

The intricate, 1152-foot long, dual roadway viaduct with its curved feeder ramps, pictured at the top, fills a double purpose in today's transportation emergency. It permits fullest utilization of railway and highway arteries which it overpasses, and streamlines the incessant traffic-flow it feeds into an under-river route to the vital seaboard.

The high-level viaduct and river crossing, also shown, is another important expediter of war traffic. It was planned primarily as a convenient express route between two industrial sections; but war has made it more than that. This viaduct is now an artery for fast-moving "priority" motor freight to docks and warehouses.

These two structures are typical of many exacting grade separations and traffic-routing projects built successfully by American Bridge Company, and planned with a foresight that stands the nation in good stead today.

Now—our entire resources are engaged in construction for war.

After Victory—these same resources of men and equipment will stand ready to serve with equal effectiveness the transportation needs of America at peace.

AMERICAN BRIDGE COMPANY

General Offices: Frick Building, Pittsburgh, Pa.

Baltimore · Boston · Chicago · Cincinnati · Cleveland · Denver · Detroit · Duluth
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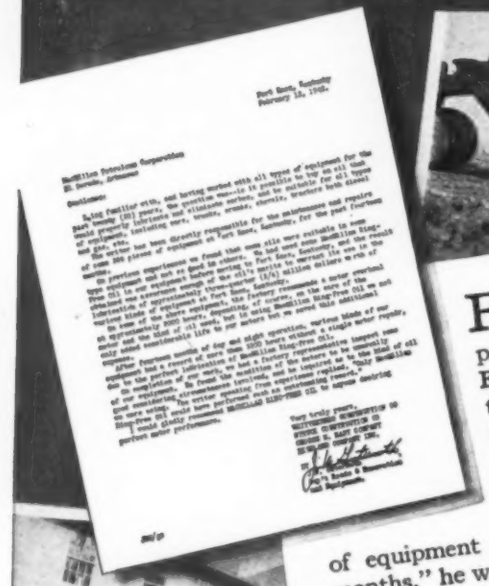
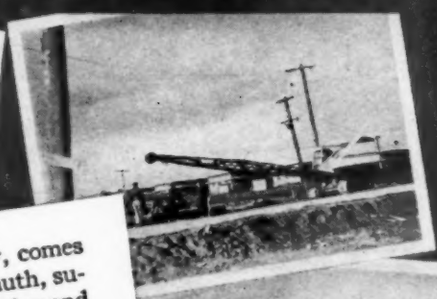
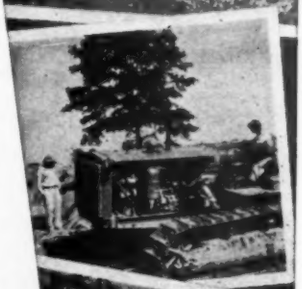
UNITED STATES STEEL

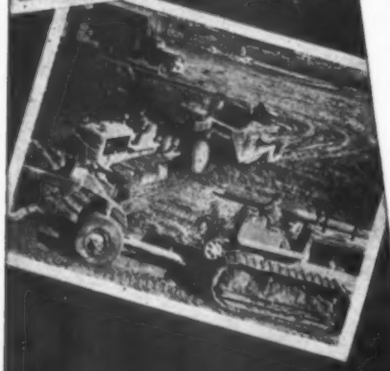
"An outstanding record" on 385 pieces of equipment

CARS • TRUCKS • CRANES • SHOVELS • DIESEL AND GAS TRACTORS









FROM FORT KNOX, Kentucky, comes a letter from J. W. Gutermuth, superintendent Roads and Excavation and Equipment for Whittenberg Construction Company, Struck Construction Company, George M. Eady Company, and Highland Company, Inc. He "has been directly responsible for the maintenance and repairs of some 385 pieces of equipment at Fort Knox for the past fourteen months," he writes in February, 1942.

In previous jobs, he says, some oils were good in some types of equipment "and not so good in others." His experience with Macmillan RING-FREE was reason enough for him to use it on $750,000 worth of equipment at Fort Knox.

On some of this equipment, the factory recommends overhauls at about 2,000 hours. But—

"After fourteen months of day and night operation," continues Mr. Gutermuth, "various kinds of our equipment had a record of more than 3,300 hours without a single motor repair, due to the perfect lubrication of Macmillan RING-FREE Oil."

When a factory representative inquired what oil had been used, Mr. Gutermuth replied:

"Only Macmillan RING-FREE Oil could have performed such an outstanding record.'

Whatever your equipment may be, write us, so that Macmillan RING-FREE can do for you what it is doing for others.

• • •

MACMILLAN PETROLEUM CORPORATION

50 West 50th St., New York
624 S. Michigan Ave., Chicago
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MACMILLAN RING-FREE MOTOR OIL

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LIMA CRANES meet demands for Extraordinary Service

Cranes - LIMA Type 750

Boom - 120′ — machine has been in operation on similar work since December, 1941 never using less than 100′ boom. Original boom hoist cable is still in use. (June 20, 1942)

Jib - 20′

Bucket - 46 Cubic Feet

Weight of Bucket and Material - 8400 lbs. or over 4 Tons

Hoist - Single Line

Job - Ft. Greene Housing Project

Location - Brooklyn, N. Y.

Contractors - Three Companies, Inc.

CORBETTA CONSTRUCTION CO., INC.
WILLCOX CONSTRUCTION CO., INC.
KNICKERBOCKER CONCRETE ARCH CONSTRUCTION CO., INC.

On the $21,000,000 Fort Greene Housing Project in Brooklyn, New York, LIMA cranes are showing the way to hoist concrete on a single line to a height of 14 floors and do it quickly, safely and economically.

General Superintendent P. L. Moccia has this to say about the LIMA cranes:

"The heavy truck-frame casting, massive crawlers and resulting low center of gravity on these LIMA cranes enables them to handle a long boom without tendency toward tipping. The positive lever control makes it possible for the operator to have the feel of his load at all times and to work surely and quickly. This saves us time on the job."

Mr. C. H. Davidson, Project Manager, also points out that their exceptional progress was further due to planning the job so as to permit continual pouring by cranes on one or another of the 38 units which he admits, required streamlined coordination.

LIMA LOCOMOTIVE WORKS, INCORPORATED
Shovel and Crane Division
LIMA, OHIO

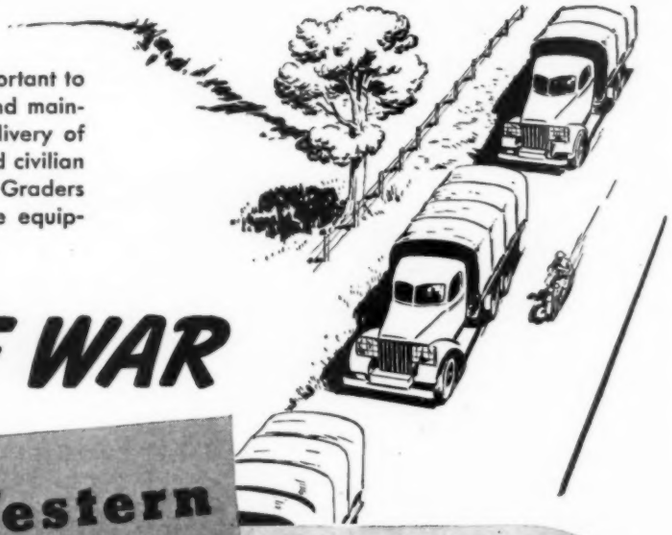
NEWARK, N. J. NEW YORK, N. Y. DALLAS, TEX. MEMPHIS, TENN. SEATTLE, WASH. PORTLAND, ORE. SAN FRANCISCO, CAL.
LOS ANGELES, CALIF SPOKANE, WASH PHILADELPHIA, PA. VANCOUVER, B. C. MONTREAL, QUEBEC, CAN.

LIMA

SHOVELS • CRANES • DRAGLINES

A TYPE AND SIZE FOR EVERY JOB

● It's going to be increasingly important to speed up the jobs of building and maintaining roads vital to on-time delivery of materials for our armed forces and civilian workers. You who own "99" Motor Graders can accelerate these jobs with the equipment described below.



WEAPONS OF WAR

"99-M"
Austin-Western
POWER GRADER

ON THE HOME FRONT

● The "99" Loader is a time- and money-saver for both construction and maintenance operations. On new highway projects it quickly removes excess dirt between forms . . . leaving a smooth, firm surface. When ditches must be cleaned or sod shoulders "skinned off", lowered and carefully graded to prevent the accumulation of surface water, it does the job in a fraction of the time otherwise required.

The "99" Shoulder-Trencher makes a straight, clean-cut trench to a maximum depth of 8" below pavement surface, and windrows waste material for easy loading into trucks by the "99" Loader. A real time-saver on highway widening operations. Write for details.

THE AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Illinois

MOTOR GRADERS • BLADE GRADERS • ELEVATING GRADERS • SCRAPERS • CRUSHING AND SCREENING PLANTS • ROLLERS
ROLL-A-PLANES • MOTOR SWEEPERS • SHOVELS AND CRANES • SCARIFIERS • DUMP CARS • TRAIL CARS

Patent Rights	
Date	Number
8-14-28	1,680,923
6-11-29	1,716,872
2-11-30	1,746,570
4- 7-31	1,799,269
11-10-31	1,831,153
2-20-40	2,190,748

Also Foreign Patents

WILSTA-FORM EXTERNAL

Trade Mark

"First Call on Defense Jobs"

Patent Rights	
Date	Number
6- 1-27	1,586,991
4-24-28	1,667,253
3-29-32	1,851,339
4-24-28	1,667,252
10- 7-29	Re.17,452
7-21-36	2,048,151

Other Patents Pending

WILLIAMS "SIMPLEX" CLAMPS

For Commercial Buildings, Sewage Disposal Plants, Filtration Plants, Architectural Concrete, Etc.

World's Largest Office Building Uses Williams "Simplex" Our War Dept. Headquarters

"SUPER-HI" TENSILE TIE RODS—3c each up to 15" Wall.
Price, 68c Per Set

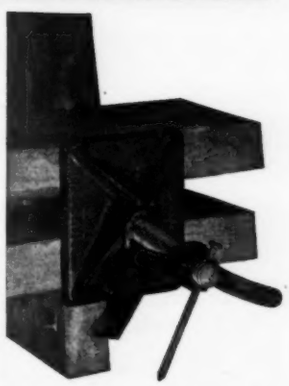
OK'd By Engineers
(Not a "Hay Wire" Tie)
7200 Lbs. Working Load. 9000 Lbs. Ultimate at the Cost of No. 9 Wire.

NO "BREAK OFF LOSS" WITH WILLIAMS TIES

WILLIAMS "VIBRA-LOCK" CLAMPS

For Dams, Bridges, Heavy Construction, Battered Walls, etc.

Number	For Inner Rod Size	Acme Thd Waler Rod Length	Bracket Size	Ordinary Mild Steel Maximum Allowable Working Load to Elastic Limit (Not Used)	USING WILLIAMS HIGH TENSILE RODS		Price Per Set 2 Waler Rods 2 Wing Nuts 2 Brackets
					Tensile Strength Ultimate	Maximum Allowable Working Load to Limit	
US-VL-1	⅜"	18"	(B-2) 3½"x5"	1,800 Lbs.	9,000 Lbs.	**7,200 Lbs.**	$1.25*
US-VL-2	⅜"	24"	(B-2) 3½"x5"	1,800 Lbs.	9,000 Lbs.	**7,200 Lbs.**	1.38
US-VL-3	⅜"	30"	(B-2) 3½"x5"	1,800 Lbs.	9,000 Lbs.	**7,200 Lbs.**	1.50
US-VL-4	⅜"	36"	(B-2) 3½"x5"	1,800 Lbs.	9,000 Lbs.	**7,200 Lbs.**	1.60
US-VL-5	½"	20"	(B-3) 4"x5"	3,200 Lbs.	16,000 Lbs.	**12,800 Lbs.**	1.55*
US-VL-6	½"	20"	(B-4) 5"x6"	3,200 Lbs.	16,000 Lbs.	**12,800 Lbs.**	1.65
US-VL-7	½"	24"	(B-3) 4"x5"	3,200 Lbs.	16,000 Lbs.	**12,800 Lbs.**	1.65
US-VL-8	½"	24"	(B-4) 5"x6"	3,200 Lbs.	16,000 Lbs.	**12,800 Lbs.**	1.75
US-VL-9	½"	30"	(B-4) 5"x6"	3,200 Lbs.	16,000 Lbs.	**12,800 Lbs.**	1.90
US-VL-10	½"	36"	(B-4) 5"x6"	3,200 Lbs.	16,000 Lbs.	**12,800 Lbs.**	2.05



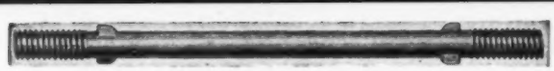
WM.'S VIBRA-LOCK CLAMP REMOVAL

Locked to Waler Rod by 20 or 30 penny Spike engaging slot in rear of Wing Nut and cross drill in Waler Rod.

WILLIAMS "SUPER-Hi" TENSILE TIE RODS

(Elastic Limit or Working Load 4 Times as High as Mild Steel)

INEXPENSIVE U. S. STANDARD THREAD RODS



(2) ⅝" diam. U. S.—16 thd. 9,500 lbs. Ultimate Tensile 7,500 lbs. Working Load per Rod			(3) ½" diam. U. S.—13 thd. 16,500 lbs. Ultimate Tensile 13,000 lbs. Working Load per Rod		
LENGTH of Rod	Price per 100 Rods	App. Wall Width	LENGTH of Rod	Price per 100 Rods	App. Wall Width
12" or less	**$3.00***	15" or less	12" or less	**$4.00***	15" or less
13"	**3.25**	16"	13"	**4.33**	16"
14"	**3.50**	17"	14"	**4.67**	17"
15"	**3.75**	18"	15"	**5.00**	18"
16"	**4.00**	19"	16"	**5.33**	19"
17"	**4.25**	20"	17"	**5.67**	20"
18"	**4.50**	21"	18"	**6.00**	21"
19"	**4.75**	22"	19"	**6.33**	22"
20"	**5.00**	23"	20"	**6.67**	23"
21"	**5.25**	24"	21"	**7.00**	24"
22"	**5.50**	25"	22"	**7.33**	25"
23"	**5.75**	26"	23"	**7.67**	26"
24"	**6.00**	27"	24"	**8.00**	27"

*Rods under 12" in length kurled to prevent turning in concrete.

WILLIAMS WALER SUPPORTS

With Stops for 4" or 6" Walers as shown.

$8.50 Per 100
State Size Waler

Eliminate

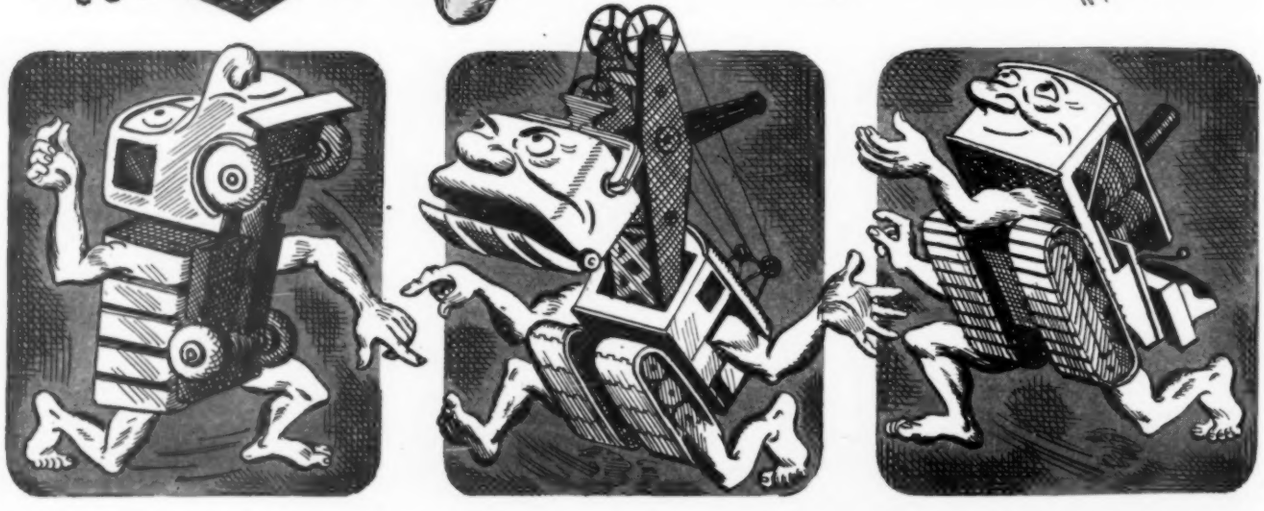
1. Nailing Walers together.
2. Building scaffolding to install clamps.
3. Placing and replacing wooden cleats.
4. May be rotated out of the way when storing sections.
5. No stepping on nails from wood cleats left lying around.

Immediate 24-hr. Service — PHONE 3-3823 — Day or Night

(Wire or phone *Collect* on orders of $100.00 or more)

WILLIAMS FORM ENGINEERING CORP.

Box 925, Madison Square Station — GRAND RAPIDS, MICHIGAN



"**Why should I?** I'm a truck with a *Cummins Diesel*—one of ten used by the Hinman Bros. Construction Company of Pittsburgh and Denver on the Letterkenny Ordnance Depot and Arlington Housing grading jobs. Altogether, we've gone 100,000 hours without an overhaul since we changed to a certain oil that eliminates sludge trouble. We keep going and feel fine because we lead *clean* lives!"

"**Naw**—tough going's easy for me. I'm a power shovel with a *Waukesha-Hesselman Diesel.* Hinman operates two of us on this same job, and we total 20,000 hours without an overhaul. Know why we don't bog down? Because we use the same oil—and it stops *ring-sticking* cold. It keeps us going strong!"

"**Rest? For what?** This heat doesn't bother me. I'm one of the 22 pieces of Hinman Bros. equipment with *Caterpillar Diesels.* All told we've gone 220-000 hours without an overhaul. Sure it's hot, but we use that oil too—and it sure *sticks to the hot spots,* so we get along swell!"

STANDARD OIL COMPANY OF CALIFORNIA

and if YOU want to keep going, old fellow, do as we do.... use RPM DELO! ♫

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HEAVY DUTY ENGINE
DIESEL ENGINE LUBRICATING OIL

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ALL MICHIGAN SHOVEL-CRANES are quickly convertible to any standard front-end attachment

MICHIGAN Mobile SHOVELS-CRANES

— — for FASTER Construction

Owners are setting records on new construction, on maintenance work, in industrial plants and on scattered operations with the MICHIGAN Mobile SHOVEL-CRANE. Fingertip Air-Controlled clutches enable operators to maintain fast pace production without let downs due to operator fatigue. Maximum stability is provided by the low gravity center and low unit ground pressures of Model TMCT-16 (½ yd. Dual Tandem Drive). This complete MICHIGAN unit, mounted on its own specially designed MICHIGAN chassis, is fully described in Bulletin RS82. Write for your copy.

The smaller MICHIGAN Model T6-D (⅜ yd. Single Axle Drive) is noted for its great productive capacity over a wide range of operations. This single-engined truck-type excavator-crane has its own specially designed and constructed chassis. Like the larger TMCT-16, Model T6-D's great stability is an outstanding feature, as are the Fingertip Air-Controlled clutches. Model T6-D is praised by owners for its low maintenance costs, flexible operation and high output. Bulletin RS82-1 tells why. Your request brings full data by return mail.

SPECIFICATIONS Models TMCT-16 and T6-D

Model	Capacity	Weights		Tail Swing	Gross Allowable weight rating
		Shovel	Crane		
TMCT-16	½ yd.	28000 lbs.	26000 lbs. to 28000 lbs.	7'-9"	35000 lbs.
T6-D	⅜ yd.	20500 lbs.	19000 lbs.	5'-6"	26300 lbs.

Bulletin RS82-2 contains detailed specifications on Model TLCT-16 (Dual Tandem Drive) designed especially for high-speed cranework. Model TF6 (⅜ yd. Four-Wheel Drive) and Model C-16 (½ yd. crawler) are completely described in Bulletins RS82-3 and RS82-4, respectively.

MICHIGAN POWER SHOVEL CO.

Benton Harbor Mich., U. S. A.

★ ★ ★

MICHIGAN

AIR-CONTROLLED

SHOVELS - CRANES - CLAMS DRAGLINES - TRENCH HOES

TO EXECUTIVES:

NOW YOU CAN HELP

Even More...

New Treasury Ruling Permits Purchases UP TO $100,000, in any Calendar Year, of Series F and G WAR BONDS!

The Treasury's decision to increase the limitations on the F and G Bonds resulted from numerous requests by purchasers who asked the opportunity to put more money into the war program.

This is not a new Bond issue and not a new series of War Bonds. Thousands of individuals, corporations, labor unions, and other organizations have this year already purchased $50,000 of Series F and G Bonds, the old limit. Under the new regulations, however, these Bond holders will be permitted to make additional purchases of $50,000 in the remaining months of the year. The new limitation on holdings of $100,000 in any one calendar year in either Series F or G, or in both series combined, is on the cost price, not on the maturity value.

Series F and G Bonds are intended primarily for larger investors and may be registered in the names of fiduciaries, corporations, labor unions and other groups, as well as in the names of individuals.

The Series F Bond is a 12-year appreciation Bond, issued on a discount basis at 74 percent of maturity value. If held to maturity, 12 years from the date of issue, the Bond draws interest equivalent to 2.53 percent a year; computed on the purchase price, compounded semiannually.

The Series G Bond is a 12-year current income Bond issued at par, and draws interest of 2.5 percent a year, paid semiannually by Treasury check.

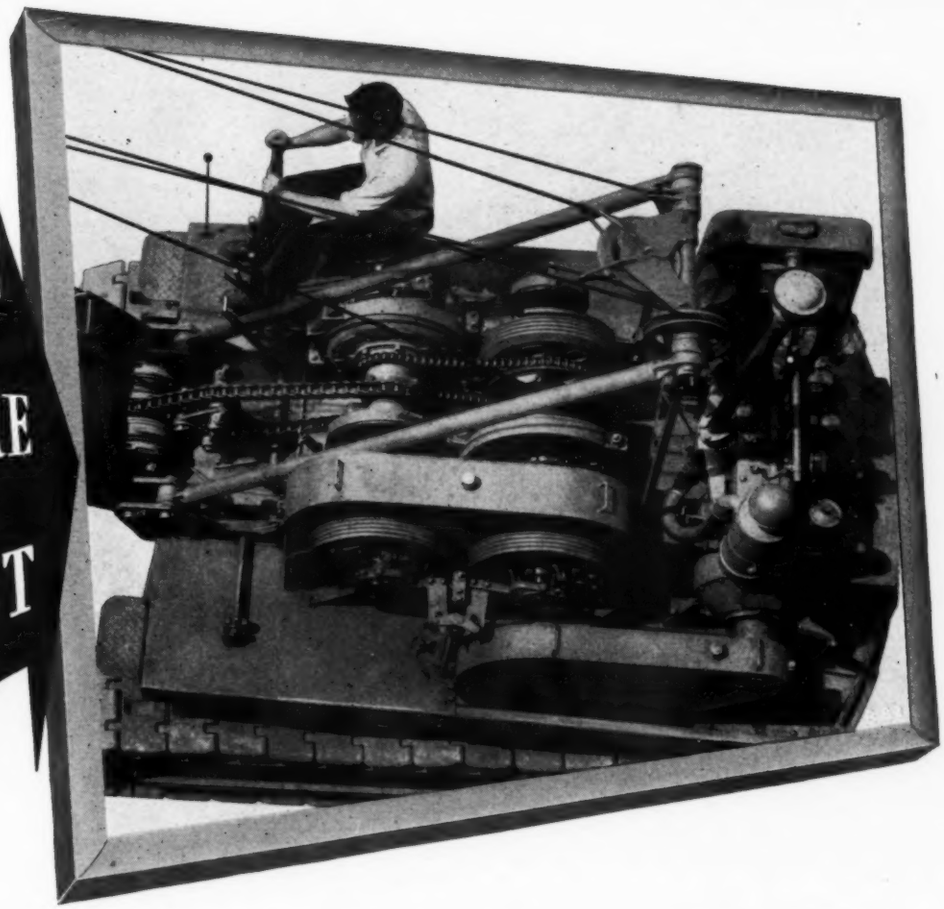
Don't delay—your "fighting dollars" are needed *now.* Your bank or post office has full details.

Save With . . .

War Savings Bonds

This space is a contribution to America's All Out War Program by ROADS AND STREETS

A PICTURE OF OUTPUT



STUDY this cab-less view of the 15-B shovel and you'll see many of the reasons it is giving owners a new idea of one-half yard output. The essential simplicity of design means smooth performance, ability to deliver big output on the 3-shift basis demanded by wartime conditions. Notice particularly:

1. Gasoline engine, 54 h. p. at 1325 r. p. m.
2. 35 anti-friction bearings give smooth power transmission.
3. Cases enclosing transmission chain and gears in oil.
4. Duplicate 20 in. diameter clutches, self-adjusting for temperature variations.
5. Independent, positive twin-rope crowd.
6. All controls within easy reach for operator.

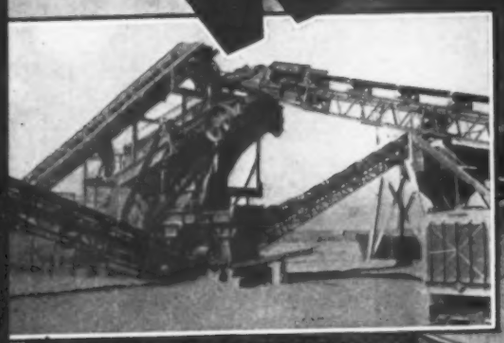
BUCYRUS ERIE

THESE ARE ONLY SOME OF THE FEATURES THAT MAKE THE 15-B A BIG-OUTPUT MACHINE. IF YOU HAVE HIGH-SPEED WAR WORK TO DO, FIND OUT THE FULL STORY OF 15-B PERFORMANCE.

Bucyrus·Erie

SOUTH MILWAUKEE, WISCONSIN

PIONEER IN THE WAR PICTURE



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MINNEAPOLIS · MINNESOTA

ROADS AND STREETS

August, 1942, Vol. 85, No. 8

Highway Crossing, Morganza Floodway, Louisiana

By N. E. LANT
Bridge Engineer
Louisiana Highway Department

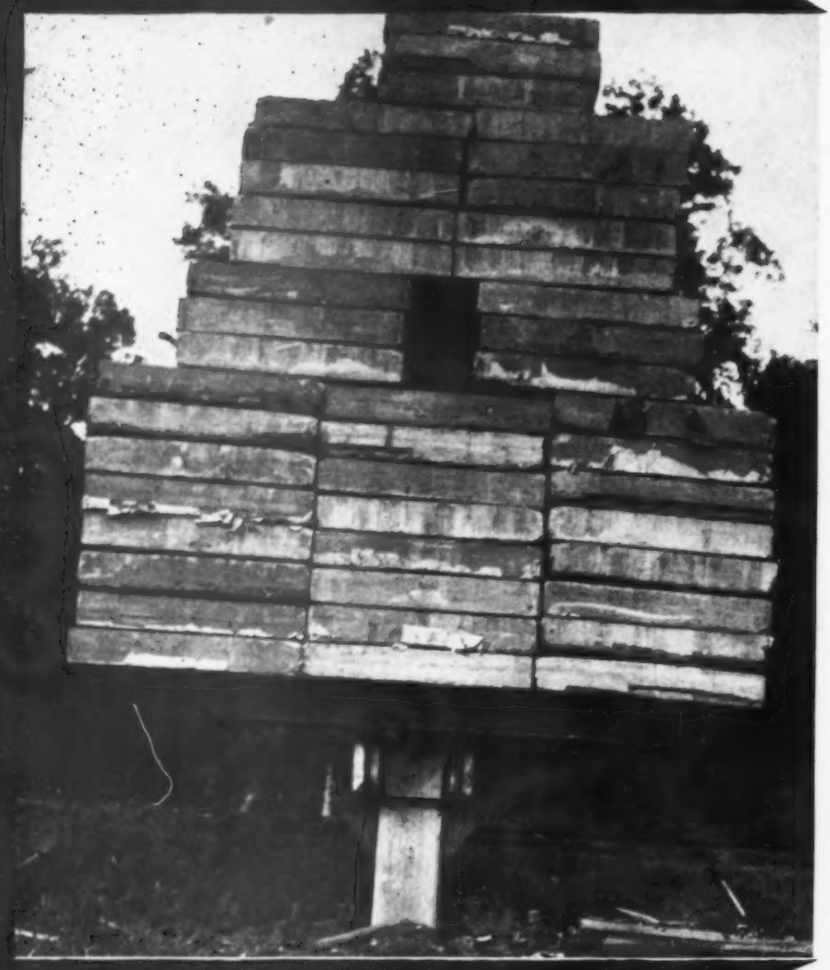
AS PROVIDED for in the Flood Control Act, negotiations were opened in 1938 by the U. S. Engineers and with the owners of highways and railroads affected by the flood control plan for the adjustment of these facilities. The flood control plan contemplated the diversion of flood waters from the main channel of the Mississippi in the latitude of Morganza of approximately 650,000 second feet to be carried to the Gulf of Mexico along the Atchafalaya River. The proposed diversion consists essentially of an uncleared floodway between parallel earth levees from six to ten miles apart, the levees being from 20 to 30 ft. high. This floodway crosses several existing highways and railroads, and the Flood Control Act provided for the raising of these utilities above the proposed floodway height and providing the necessary bridging.

Studies Made in 1938-39

During 1938 and 1939 studies were made by the engineers of the War Department, U. S. Engineers, the affected railroads and the Louisiana Highway Commission preliminary to agreement as to the alignment, type and typical section of the new high level crossings. The cost of all work, including engineering and right of way is to be provided for by the Federal Government from special appropriation for flood control.

The most important highway crossing involved in the upper section of the Morganza Floodway project is the crossing of U. S. Highway No. 190, an east and west road between Baton Rouge and Opelousas. This is one of the primary highways of the state system. It had been constructed in 1929 and 1930 as a 2-lane highway with 20-ft. wide concrete pavement, but with sufficient embankment width and drainage structure width to provide for a 4-lane highway in the future. The agreement entered into with the War Department for the raising of this highway over the Morganza Floodway, therefore, provided for a 4-lane highway having sufficient

Typical section of completed bridge



height to be above the flood waters which would be diverted from the main river at Morganza and flow down the floodway. The agreement was entered into, the plans were completed by the Louisiana Highway Commission and approved by the War Department, and contract let for this crossing late in 1940. The approximate length of the project between guide levees is seven miles, divided about equally between embankment and bridging. The bridging is located in the approximate center of the floodway, and is 18,750 feet, or approximately 3½ miles long.

General Features of Project

The approved plans provided for a reinforced concrete pile trestle structure consisting of 458 41-ft. concrete deck girder spans having a 50-ft. clear roadway, 2½-ft. walkway on each side and a center dividing curb. These girder spans are supported on precast reinforced concrete pile bents, the number of piles per bent being five, six or seven piles, depending on the resistance encountered. The piles are 24-in. square and the design load per pile is 60 tons for a 5-pile bent; 50 tons for a 6-pile bent and 42 tons for a 7-pile bent. The precast concrete piles extend approximately 21 ft. above the natural ground level and terminate in a reinforced concrete cap rectangular in section.

Concrete Pile Casting

A series of deep core borings approximately 100 ft. deep and at 500-ft. intervals, were made previous to the selection of span length and design of pile bents. Provision was made in the construction contract for the driving and loading of 94 full size concrete test piles which provided a test pile at approximate 200-ft. intervals along the centerline. After approximately 20 per cent of the test piles had been driven and loaded, a bill of permanent piling indicating length of piles and number of piles per bent was furnished the general contractor so the casting of permanent piles could proceed. All permanent piles were required to be cured 28 days before driving.

In the early part of 1941, a construction plant was set up, concrete test piles were cast adjacent to their location along the centerline; concrete loading blocks were cast and the operation of driving and loading of test piles was started. At the same time, a central plant was being set up for mixing concrete to be used in piles, caps and girders, complete with material stock piles and steel fabricating

platforms; also, pile beds were constructed on which to cast and cure permanent piles. The driving of permanent piles followed the test piles, starting about the middle of 1941, which operation was followed by the construction of caps and sometime later by starting the construction of girder spans.

Driving the Concrete Piles

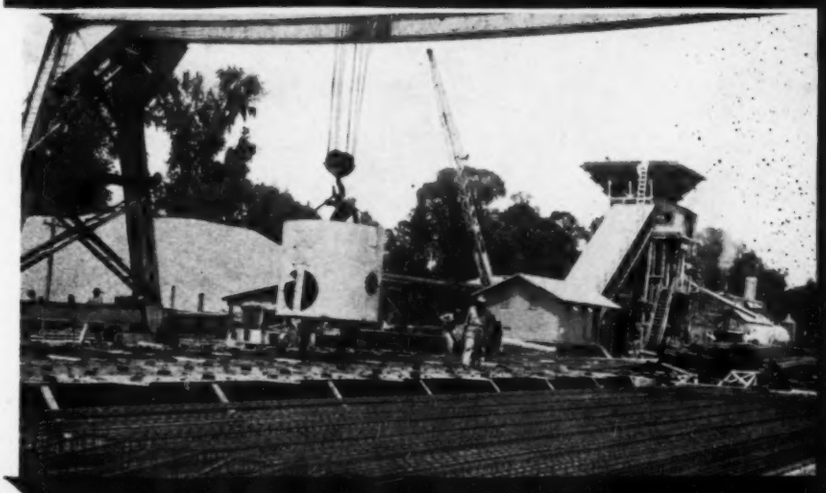
The lengths of piles varies from 75 ft. to 90 ft., and the number of piles per bent either six or seven piles. No 5-pile bents were used and the only 6-pile bents that were used were near the east end of the bridge where a layer of sand was encountered approximately 50 ft. below the ground surface. Generally, however, the penetration required for satisfactory resistance is from 60 to 70 ft.

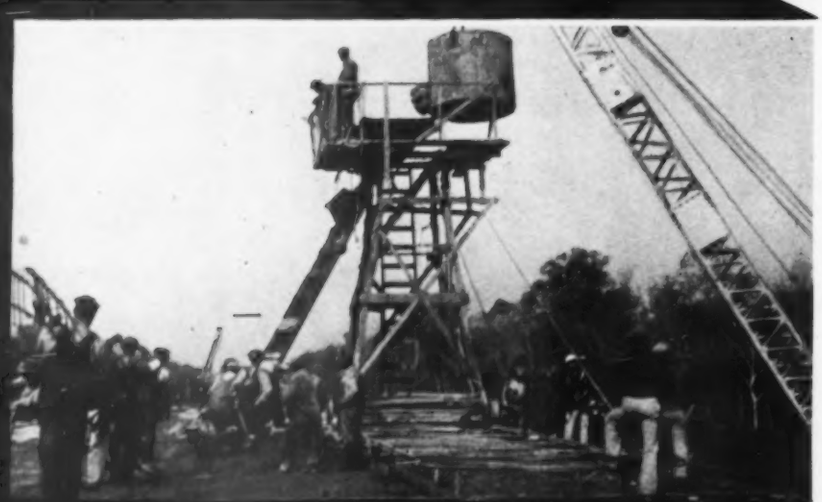
All permanent piles are cast and cured in a central yard and transported to driver on a standard gauge industrial railroad, using a specially built flat car. All concrete for girders, caps, rails and curbs is mixed in the central mixing plant and transported by standard gauge industrial railroad to the point of placement in bottom dump buckets and handled by crawler cranes. All material in the pile yard, including reinforcing cages, forms, and completed piles are handled by a gantry crane, electrically operated. The central mixing plant is also powered by electric current produced by a diesel motored generator set which is a part of the plant layout.

All side forms for permanent piling, caps, girders, rail and center curb are steel forms and the girder forms are supported on steel I-beams swung in stirrups between concrete bent caps. The time limit on this contract of 450 working days, is such that after the preliminary work was done, including test pile work, and setting up of the plant, it was necessary to drive the piles, cast the girders, rails and center curbs at the approximate rate of ten spans per week. The pile driving has exceeded this rate somewhat; generally, the progress has been about 12 bents per week, of 7 85-ft. piles per bent. Provision has been made so that little, if any, time is lost on account of showers or local rains. A tarpaulin cover with supporting frame work being provided for use in covering girder spans which are being cast or finished during such periods. At the present rate of progress the bridge contract will be completed early in 1943.

Earth Embankment Approaches

The approved plans provide for approximately 3½ miles of earth em-





bankment approaches to be constructed with a 62-ft. crown width and 4:1 side slopes. The height of the embankment varies from 20 to 30 ft. The embankment is about equally divided on the east and west ends of the project. A separate contract was let for the embankment approaches after having made extensive core borings along the embankment centerline, and after having made complete soil borings and analyses of materials in available borrow pit areas. The embankment was required to be constructed by the moisture control method with material from designated areas. Subsidence plates were required to be placed in prepared beds on the natural ground at the centerline and quarter points of the typical section and at 500-ft. intervals before the embankment was placed so that a direct check could be obtained on the actual subsidence to compare with the subsidence computed from the undisturbed cores tested in the soils laboratory.

The contract for the embankment was let early in 1941, and after the borrow pit areas were cleared, grubbed and drained, hauling of the embankment material was started. Euclid trucks and crawler wagons were loaded with crawler drag line from the borrow pit and the embankment construction proceeded from the west toward the east. After being dumped, the embankment material was spread in 8-in. layers with Caterpillar tractors with bulldozers and rolled with sheep's foot rollers pulled behind tractors. Rolling proceeded until tests showed material to be at the optimum moisture content.

Equipment Used

The principal equipment used on the bridge contract consists of: 2 pile drivers with steel leads, one of which has leads 113 ft. high, used for driving permanent piles, and the other, which is 107 ft. high, is used for driving test piles. Two Vulcan single-acting hammers—size OR with 9500-lb. ram were used. One Ransome electric 2-cu. yd. capacity concrete mixer was in the central mixing plant with standby mixer of CMC 1-cu. yd. capacity. Cranes used consist of one Koehring 1½-yd. crane for handling deck concrete, one Koehring ¾-yd. crane for setting deck forms, 1 P&H 1½-yd. crane for pouring caps, 1 Lorain 1-yd. crane for filling material bins, 1 Browning - Loc type crane ⅝-yd., for handling reinforcing and moving driver, 1 steel derrick with Novo hoist for handling handrail and dividing curb construction, 2 Vulcan

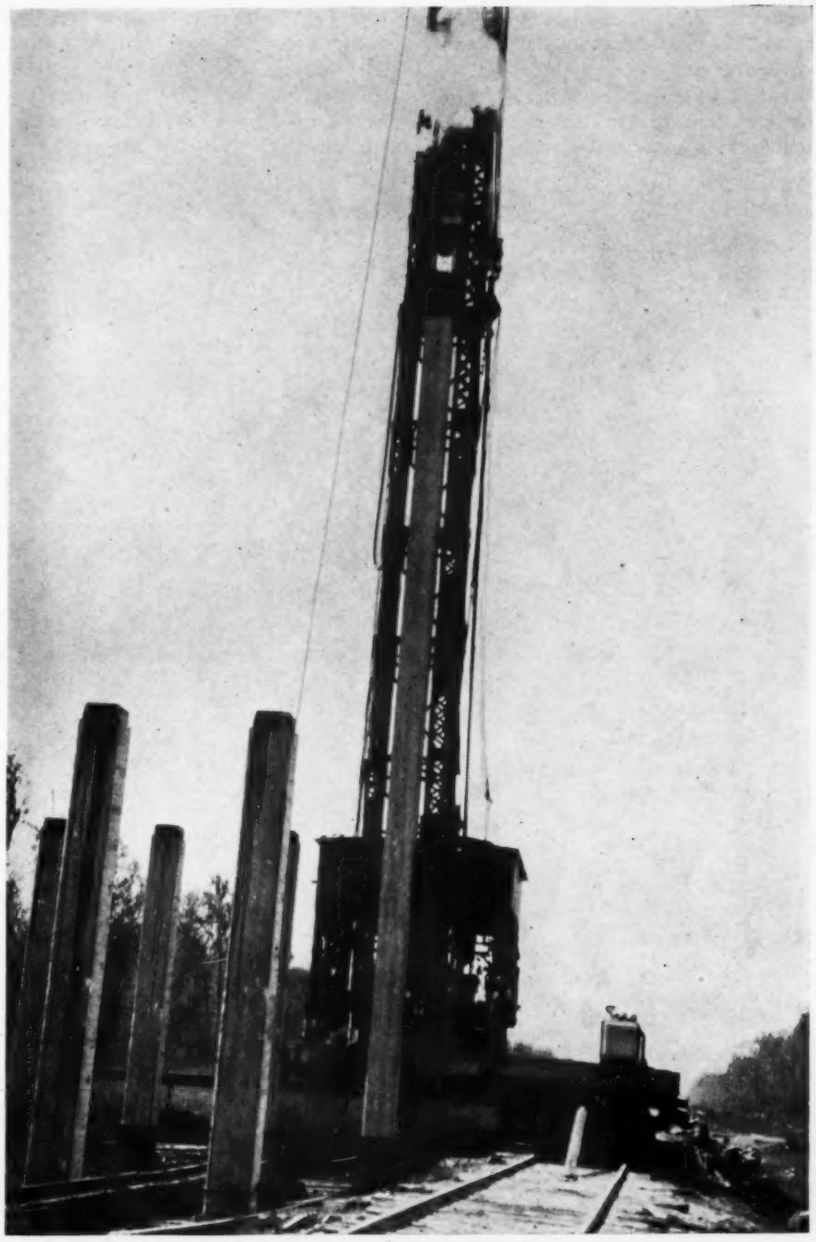
12-ton industrial locomotives—2 Plymouth 8-ton, and 1 Whitcomb 5-ton industrial locomotive, 13 standard gauge industrial railroad flat cars, 3 Kohler light plants, and 8 White 3½-in. concrete vibrators. Mixing plant and pile yard is equipped with 25-ton Case electric gantry crane, 78-ft. gauge. Power plant is equipped with 200-H. P. Fairbanks-Morse Type "Y" Diesel 2300-volt power plant. The water supply is provided by one 2½-in. electric piston pump, one 4-in. electric Gorman-Rupp centrifugal pump, one 4-in. gas Rex centrifugal pump, one 3-in. gas Jaeger centrifugal pump, 2 2-in. centrifugal pumps. The reinforcing steel was bent with two Kardong electric-driven bar benders and one Alamo electric-driven spiral bender. Steel forms and supporting beams were provided for 31 girder spans and steel forms were provided for four spans on center curb and handrail.

Equipment on the approach embankment construction consists of: 1 Northwest Model 8 2½-cu. yd. dragline, 4 Athey wagons, 2 Euclid track trucks, 14 yd., 2 Euclid track trucks—10 yd., 4 Euclid track trucks—8 yd., 4 Caterpillar tractors with bulldozers, 4 D8 Caterpillar tractors to pull cat wagons, 2 sheep's foot rollers—4 units, 1 Caterpillar motor patrol, 4 Kohler light plants, 1 Caterpillar light plant, 2 Rex water pumps.

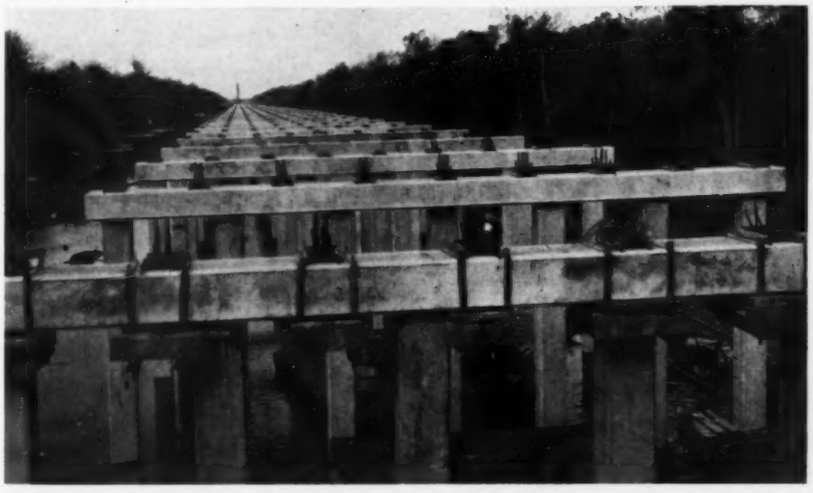
Personnel and Quantities

The bridge contract is held by the T. L. James Co., Inc., of Ruston, La., and the Keliher Construction Co. of Dallas, Tex. L. J. N. Keliher has general charge for these companies. Gordon Walker is superintendent and R. H. Sherman and J. B. Ruth are assistant superintendents.

The amount of this contract is approximately $3,400,000, and involves:



Driving 90 ft. 24 in. sq. pile with XR Vulcan hammer



Complete pile bents with girder bearing devices and supports for concrete girder forms

48,300 cu. yd. concrete
13,600,000 lb. reinforcing steel
1,700,000 lb. structural steel
273,000 lin. ft. 24 in. square concrete piling
37,000 lin. ft. handrailing
18,750 lin. ft. center dividing curb
94 test piles

The approach embankment contract is held by the Forcum-James Co. of Dyersburg, Tenn., and Baton Rouge, La., with Ralph M. Ford in charge as Louisiana manager, and E. L. Graham as superintendent in charge at the site.

The amount of this contract is approximately $360,000, and involves:

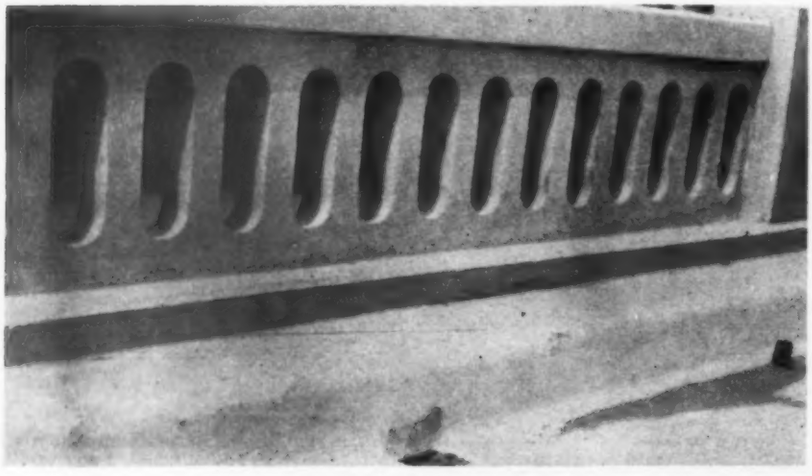
1,500,000 cu. yd. embankment
7,000,000 station yards overhaul
200,000 sq. yd. tuft sodding
130 acres clearing and grubbing

All work is being done under the direct supervision of the Louisiana State

Department of Highways, who also made the field surveys, foundation borings, designs, plans, etc. Field supervision and construction is under the direction of S. C. Smith, Construction Engineer, Department of Highways. All work is being financed by the Federal Government with flood control funds under the supervision of District Engineer DeWitt C. Jones of New Orleans, and W. J. Johnson, Jr., engineer at the site of the work.

Steel forms for 41 ft. girder spans showing cross diaphragm

Striking off and finishing concrete 41 ft. girder span



Typical handrail section

End view of center dividing curb 1-10½" high 2'-6" wide at base

Road Mileage and Land Area

Road inventories made by the Minnesota Highway Planning Surveys show that average number of miles of rural roads in 10 Midwestern states was 104,456, and the average number of miles per square mile of land area was 1.58. The following table shows the mileages for the 10 states:

State	Miles of Rural Roads Total	Per Sq. Mile
Minnesota	109,234	1.35
Illinois	102,683	1.83
Iowa	101,899	1.83
Kansas	128,198	1.56
Michigan	92,146	1.60
Missouri	116,694	1.69
Nebraska	100,315	1.30
North Dakota	110,053	1.57
South Dakota	101,145	1.31
Wisconsin	82,193	1.48
Average	104,456	1.58

Minnesota has a lower than average number of rural dwellings per mile of road, the surveys showed. States with large urban population generally also have more densely populated rural areas, as well as a greater number of motor vehicles. The average number of rural dwellings per mile of rural road, and the average number of motor vehicles, were found to be as follows:

State	Number per Mile of Rural Road: Rural Dwellings	Motor Vehicles
Minnesota	2.0	8.0
Illinois	3.1	18.8
Iowa	2.3	7.8
Kansas	1.5	4.5
Michigan	3.8	16.8
Missouri	2.7	7.9
Nebraska	1.3	4.1
North Dakota	.7	1.6
South Dakota	.8	1.9
Wisconsin	3.0	10.9
Average	2.1	8.0

Rural dwellings include farm units and all other places of residence outside city and village limits. Motor vehicles include both rural and urban cars and trucks but no trailers, according to 1940 registrations.

National Safety Congress to Meet in October.—The 31st National Safety Congress and Exposition will be held Oct. 6, 7 and 8.

Hemisphere Highway to Victory

The Pan American Aids Democracy's Arsenal

By HERBERT C. LANKS

IT is evident as the weary months grind past that production of military equipment is not the complete answer to victory on the world-wide battle fronts.

The war effort has developed into four phases: (1) the Battle for Raw Materials; (2) the Battle of Increased Production; (3) the Battle of Supply Lines; and (4) the Battle of Military Forces. Each is consecutively dependent upon the other for ultimate military success. Right now the transportation factor involved in the Battle of Supply Lines is the principal equation affecting the course of the war and perhaps determining its final outcome.

Supply routes as well as geography govern the strategy of the Battle of the Atlantic. The Axis wants to cut these routes. The United Nations must at all costs maintain them.

The Vital Character of the Road

Conceived eighteen years ago, the pattern of the Pan American Highway, the greatest construction task of all time, will fit conspicuously into the global interplay of forces, by reinforcing the supply routes of the United Nations. The Pan American Highway may soon become an inside military supply line in the all-out effort to transport strategic materials to United States industries, as well as serve as a flexible inner line of military offense and defense supporting our "First Line of Defense," the U. S. Navy. Its economic aspect as a stimulus to the development of intra-Latin American trade is equally important.

The 16,000-mile Pan American Highway, now being rushed to completion, links North, Central and South America. It will constitute a vital transportation artery to move strategic raw materials to the Arsenal of Democracy. Conversely, it will aid in transporting great quantities of finished military weapons to key points of resistance. The Canadian-Alaskan Highway, construction of which has now begun, will form the northernmost unit of the strategic artery linking the Western Hemisphere.

Mr. Herbert C. Lanks, author of this article, is one of the very few men who has traversed the full length of the Pan American Highway. He and his companion, Major Paul Pleiss, F.R.G.S., were the first persons to make the trip by automobile from the Caribbean Sea to the Straits of Magellan.

Mr. Lanks is the author of "By Pan American Highway through South America," a volume of text and pictures just published by D. Appleton-Century Co.; and is co-author with Harry A. Franck of "The Pan American Highway from the Rio Grande to the Canal Zone," a recent work of similar character, also published by Appleton-Century.

Mr. Lanks' observations in the concurrent article will, we believe, be found of much interest by readers in both North and South America. All of the pictures were taken by Mr. Lanks personally. We regret that prints showing other portions of the route were not available at the time this article was prepared for the press.

THE EDITOR

The United States has shifted into high gear in its productive efforts. However, authorities have reluctantly concluded that the progress of the war will not be favorable until the transportation problem is solved. The United States is approaching a production rate of about two ships a day —approximately the rate ships of the United Nations are being sunk or damaged by Axis raiders. Later, perhaps ships will be constructed faster. Our prodigious ship-building program may solve the problem, but it will take years to achieve this goal. On the other hand, there is no assurance that sinkings will not increase in proportion to the increased ship-building rate.

Strategic Raw Materials

The results of our productive efforts will be largely determined by the volume of strategic raw materials we can obtain from our Good Neighbors before we may expect to achieve continuous production and transportation of military equipment to the fighting fronts. Battles are won literally from the ground up.

The great military and naval battles in progress in the Pacific theatre of war have made former trans-oceanic sources of normal supplies of strategic materials undependable. Latin American supplies are of incalculable value to the United States. The Army and Navy Munitions Board lists 14 strategic materials "for which strict conservation and distribution control measures will be necessary." These materials are antimony, chromium, coconut-shell char, ferrograde manganese, manila fiber, mercury, mica, nickel, quartz crystal, quinine, rubber, silk, tin and tungsten. All of these strategic military materials are part of the great natural resources of the American Republics. The War Production Board is constantly widening priority restrictions on civilian use of rubber, sugar, tin, and dozens of other commodities, many of which are available in great quantities in Latin America. Consequently, this source is even more important than had been originally anticipated.

A recent government survey disclosed that the soil and climate of Central America are exceptionally favorable for the production of camphor, hemp, industrial oils, tea, spices, and rubber. These products were found to be in easily accessible zones. The survey further demonstrated that Latin America could be made the most diversified tropical agricultural area in the world.

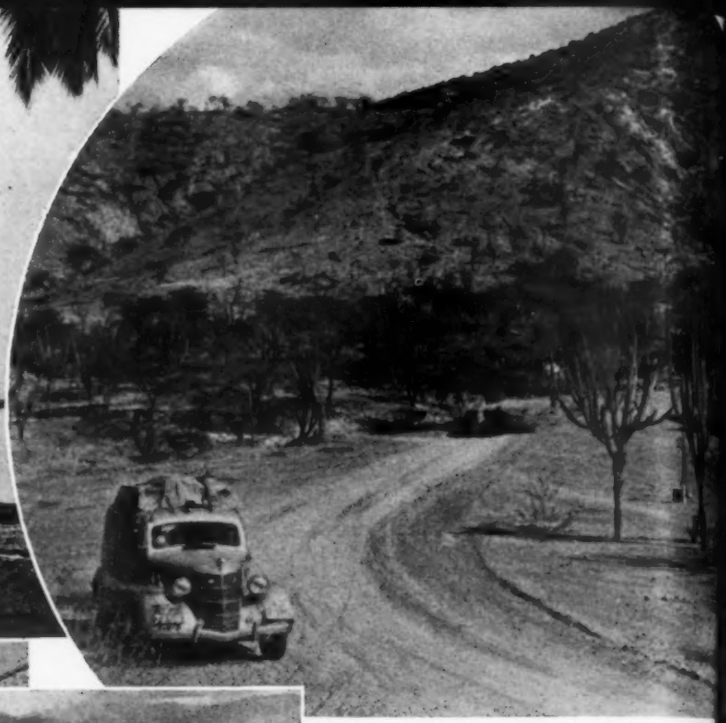
Since it is beyond doubt that Latin America is an important source of our raw materials, we must provide for the reliable transportation of its valuable resources.

Highways, Railways, Seaways and Airways

The importance of strategic highways has been emphasized by the

(Continued on page 38)

Palm lined drive on the shore of Lake Maracaibo near Cabinas, Venezuela



Desert-like country along the Simon Bolivar Highway near Carora in western Venezuela

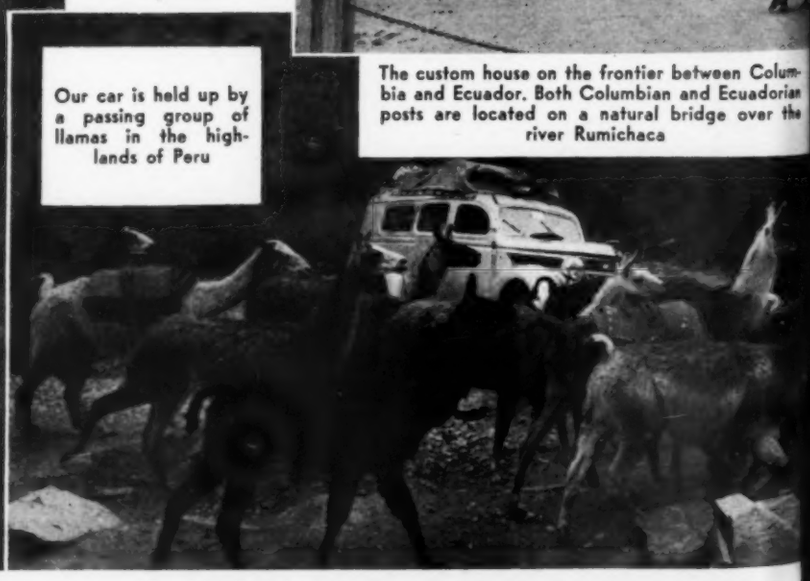
At a Columbian highway police control station between the Venezuelan border and Bogota. There are many such stations where papers are examined

Strange vegetation on the paramo of the Andes in Columbia. Altitude 13,000 to 15,000 feet

The custom house on the frontier between Columbia and Ecuador. Both Columbian and Ecuadorian posts are located on a natural bridge over the river Rumichaca

A typical stretch of Ecuadorian highway, generally built of heavy stone for one car width in the center, with broad earth shoulders for passing and for animal traffic

Our car is held up by a passing group of llamas in the highlands of Peru

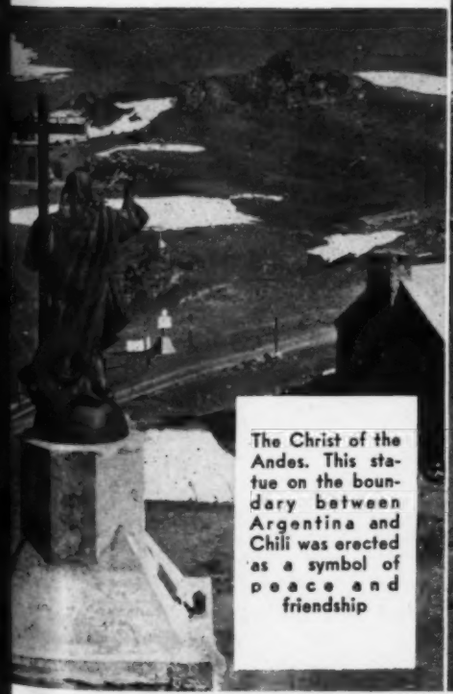


New road building machinery on its way from Rio de Janeiro to the interior of Brazil

The ever-fascinating panorama of Rio and its harbor

Uruguay boasts the largest percentage of paved highway in all Latin America. Here is a tree-lined stretch

An Argentine Automobile Club (ACA) service and information station. The odd structure at the left carries a road map which is illuminated at night so that motorists can study it without getting out of cars



The Christ of the Andes. This statue on the boundary between Argentina and Chili was erected as a symbol of peace and friendship

At bottom of picture is the road leading to the final ascent of the Christ of the Andes Pass. To the left is the railway tunnel portal. This view is on the Chilean side

The port of Magellanes, Chile, on the Strait of Magellan. Ours was the first car to reach this point after traveling the full length of South America

OF MAGELLAN AND BACK TO RIO

stirring saga of China's Burma Road, which until recently fed the valiant Chinese armies with vital military supplies through Burma. Compare: A bomb dropped on a ship, representing perhaps a year's labor, may destroy the ship and its cargo in a few minutes, along with a portion of its valuable crew. On the other hand, a bomb dropped on a highway,—laborers promptly fill the hole. The Chinese said that it costs the Japanese $1,000 or more to drop a bomb on the Burma Road—it costs the Chinese only eight cents to fill the hole.

Japanese cutting of China's "Life Line" is not expected to diminish the flow of U. S. supplies. A new highway route from India to China has already been projected across the tortuous Himalaya mountains, and there is every reason to believe that the Chinese people will achieve a new miracle of determination by completing this road in record time.

As ships are not the complete answer, so too are roads not the complete answer. Like modern warfare, which requires integrated coordination of warships, planes and land forces; ships, highways, railroads and airlines must be coordinated if the stream of strategic materials is not to dry up at its source.

Construction Progress

The 13,200 miles of the Pan American Highway in Central and South America are now 87 per cent usable in "dry weather." In South America 96 per cent is usable during "dry weather." Long stretches of the highway in Mexico, Guatemala, Panama, Venezuela, Colombia, Peru, Argentina, Uruguay and Brazil are already paved with "all weather" surfacing. The highway's availability will increase as the war progresses.

The new Trans-Isthmian military highway joins the 3,200 miles of the Inter-American Highway (Central American section of the Pan American Highway). The Trans-Isthmian Highway parallels the Panama Canal and links the Atlantic and Pacific. Grading construction has been completed recently, and it may be expected that this new highway will augment the defenses of the Panama Canal and the military importance of the Pan American Highway.

The Inter-American section of the Highway is now about two-thirds complete in unconnected sections, from the Mexico-United States border through Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama to the Panama Canal and 80 miles farther south to Rio Hato, site of a huge military airport now under construction. Now that U-boats range the Atlantic and Caribbean areas adjacent to the Canal, we realize as never before that the Panama Canal is not immune from attack. Should the Canal be attacked or damaged, the linked Trans-Isthmian and Inter-American Highways will aid immeasurably as a medium to move troops and supplies to protect the Panama Canal. Thus the Pan American Highway and its network of access highways may soon become the key to hemisphere defense.

At the present time $78,365,000 is being spent on construction in Central and South America. Secretary of State Cordell Hull, in a recent letter to President Roosevelt, recommending additional financing of the Pan American Highway, embodied the following reasons for his request: defense value; improved transportation within and between the several countries and the United States; development of new lands and new natural resources, and increased consumption of American imports; increased employment and maintenance of Latin American economic structures; increased tourist traffic; increased market for American automobiles, parts, garage equipment, etc.

The Road Brings Business

Already, over Mexico's 900 miles of paved road 1,800 United States-made passenger buses and 20,000 trucks are using Mexican highways, moving civilian and military supplies. In one year U. S. motorists have spent more than 37 million dollars in Mexico, a sum representing more than the value of any principal Mexican export. The population on the fringes of the highway zones has trebled as a natural consequence of the economic advantages accruing wherever highways make possible easy shipping of commodities. Scores of access roads have increased the highway's influence within a 40-mile radius. Farm production along the Pan American Highway has increased tenfold, and in its path the highway has brought improvement to the social and political patterns of Latin American life.

The importance of highways in a nation's economy may perhaps best be illustrated by pointing out that in Nicaragua only five per cent of its arable area is worked. In Brazil the percentage is still lower, only three per cent. A prime factor causing the lagging development of these nations has been the lack of adequate transportation.

As the economic dislocations of the war spread, the United States in cooperation with Latin American nations is straining every effort to complete the highway in record time in order to safeguard the economic and military gains of the Good Neighbor policy and the mutual agreements made at the recent Inter-American Conference at Rio de Janeiro.

Major Obstacles to Construction

Principle obstacles to completion of the Pan American Highway are a 300-mile, virtually unexplored, jungle area of the Darien Isthmus between the Panama Canal and Colombia, South America, and 289 miles in the region of the seaport Guayaquil in Ecuador. The Darien Isthmus has not even been thoroughly surveyed, and so far only one man has penetrated the interior to Colombia. For some time it will be necessary to bypass this route by ship-ferry to Buenaventura, Colombia, on the Pacific coast of South America, or La Guaira, Venezuela, on the Caribbean Sea. Construction in Ecuador has been financed and is being rushed to completion to bridge the gap in South America's 8,000-mile section of the Pan American Highway.

At the recent Fourth Pan American Highway Congress, a projected plan was approved to link the United States from Florida to and through Cuba and the Yucatan Peninsula of Mexico, as well as Haiti, the Dominican Republic, and Puerto Rico, in a trans-marine highway network with intervening water jumps to be bridged by ship-ferry service.

Many problems have been encountered and solved since the highway project was undertaken,—engineering problems, financing, traffic control regulations, and sanitation.

No continent in the world presents more or greater difficulties than South America in the development of an integrated communication system for overland transportation. Even basic geographical facts were not available for the use of engineers when construction plans were being devised.

South America has the longest continuous cordillera in the world, paralleling the western coastline and reaching heights of over 16,000 feet. On the mountain ranges where the mountains become broader, the altiplano, frequently at elevations of 10,000 and 12,000 feet, remains undrained over large areas, so that in the rainy season water settles on hundreds of square miles until it evaporates or soaks in.

Solving the drainage problem was necessary if the road was not to be washed out during the long rainy

seasons in tropical areas. Some parts of the Pacific coastal region have excessive rainfall—300 inches or more annually. Carefully studied bridge building plans were required to guard against wash-outs by flash floods.

Like the Burma Road, parts of the Pan American Highway are handmade. Lack of construction machinery required considerable use of hand labor in some countries in Latin America. Certain Latin American nations require every able-bodied citizen to work for two weeks on the highway in payment for taxes.

In some areas proper surfacing could not be obtained. Special tests were devised which resulted in the use of a native product, wherever available, as a surfacing substitute.

High altitudes, as in the case of Peru where the highway climbs over 16,000 feet to cross the Anticona Pass, created difficulties in the movement of construction equipment in rarefied atmosphere and strained laborers working at such heights.

At a point north of Lima, capital of Peru, a range of sand hills creates a constant problem of maintenance of the highway constructed through it. This section extends about ten miles. The sand dunes in this area rise to a height of 1,500 feet. The sand is so fine and the slopes so steep that towards evening, when the sun has thoroughly dried the surface of the dunes, the sand begins to flow like water towards the highway and by erosion reaches the highway. The streams of sand pour over masonry retaining walls and pile up in large cones on the road. Gangs of men with trucks are constantly at work removing these accumulations, and if the blow sands were not removed for a single day they would stop traffic completely.

The Los Andes route through Chile to Argentina, along which is located the famous Christ of the Andes, cannot be counted upon to remain open for more than four months a year because of winter snows. An alternative route beyond this 10,000-foot pass is too far south to remain entirely snow-free in spite of its low altitude. Another alternative route was built from La Paz, Bolivia, south through Argentina to Buenos Aires to provide an all-year route. From Buenos Aires the Pan American Highway turns north through Uruguay and traverses 1,500 miles in Brazil to reach its present terminus, Rio de Janeiro.

These conditions display in part the serious problems which the engineers representing the governments of the United States and the South and Central American countries have faced and overcome in fulfilling their dream to connect the two continents of the New World; and already the Pan American Highway is pumping vitality throughout the Western Hemisphere, which must remain strong if we are to live securely.

Concrete and Concrete Aggregate at A.S.T.M. Meeting

The 16th session of the recent annual meeting of American Association for Testing Materials, devoted to building materials and concrete and concrete aggregates, was an extensive one with many technical papers and reports.

Featuring the portion of the session on concrete was the recognition of the winner of the Sanford E. Thompson Award, John Tucker, Jr., Chief, Concreting Materials Section, National Bureau of Standards, who received citation for his paper on "Statistical Theory of the Effect of Dimensions and of Method of Loading upon the Modulus of Rupture of Beams."

Committee C-9 on Concrete and Concrete Aggregates amplified its recommendations by asking that numerous tentative standards be adopted. The standard for ready mixed concrete C-94 is to be withdrawn but the tentative C 94-41 T is being continued. Important recommendations in the report included specifications for waterproof paper for curing concrete, which paper "shall consist of two sheets of plain kraft paper cemented together with a bituminous material in which are embedded cords or strands of fiber running in both directions of the paper, not more than 1¼ in. apart. The paper shall be light in color, shall be free of visible defects, and shall have a uniform appearance."

Three new tests covering sampling of fresh concrete, measuring length of drilled concrete cores and test for air content of freshly mixed concrete were recommended. The sampling method covers procedure for obtaining materials from mixers, hoppers, or transportation units. The method of measuring length of drilled concrete cores, is based on very extended research in one of the subcommittees and the project report prepared by L. W. Teller, explained the work that had been done which involved studies of questionnaires actual test work, etc.

A paper on the influence of the durability of aggregate upon the durability of concrete resulted in considerable discussion. The author on the basis of tests, gave certain conclusions: (1) For material of the types included in these tests, there is no dependable correlation between results of the soundness test upon aggregates, *per se*, and the durability of the resulting concrete; (2) Field service record should be given greater weight than laboratory tests in acceptance or rejection of aggregates; (3) Compressive strength is not a reliable index of deterioration in concretes of the type used in this investigation.

Another interesting paper described factors influencing the reflectivity of white portland cement concretes. The maximum reflectivity is reached with a water-cement ratio of between 7 and 8 gal. per sack. Fine aggregates effect the reflectivity whereas coarse aggregates apparently do not. Trowel finished surface is better than others indicating the desirability of using a forming tool.

Powdered aluminum as an admixture to concrete was the subject of a very extensive paper by R. W. Carlson, Massachusetts Institute of Technology. Since the tests in the opinion of the author were not comprehensive enough to permit drawing of final conclusion, he submitted tentative conclusions which seemed to be warranted.

1. A large improvement in resistance to freezing-and-thawing with calcium chloride can be obtained by adding a sufficient quantity of finely-ground aluminum to cause a reduction in the concrete weight of several per cent; if the aluminum is interground with the cement, up to 0.020 per cent of aluminum is indicated and if the aluminum is simply admixed, up to 0.014 per cent is indicated.

2. Bond strength to reinforcing steel is improved markedly by the addition of from 0.005 to 0.014 per cent of finely ground aluminum to the concrete mix.

3. Flexural strength of concrete can be improved appreciably by the addition of from 0.005 to 0.014 per cent of aluminum powder, even though the attendant compressive strength may be decreased.

4. The compressive strength of all but harsh mixes and confined concrete is reduced by the addition of aluminum powder to the mix.

5. Optimum strength usually is obtained with about 0.007 of aluminum powder by weight of cement, but optimum resistance to freezing-and-thawing is obtained with two to four times as much aluminum.

1. Working on a 24-hour, round-the-year schedule, tractors are going to need proper maintenance as never before. In deep mud and slush, they undergo unusual abrasive conditions. Proper care of the track mechanism will pay out in a big way

By ASA LINDLEY

Part I

MORE and more contractors, realizing that their current equipment may have to serve them for an indefinite period of time, are doing the things which will add thousands of hours to the life of their units. They're not only saving money; more than that, they're helping to release other machines to build the airports, shipyards, highways, cantonments and bases that will win the war.

No Elaborate Program Required

No elaborate, time-consuming program of maintenance is involved. All that is necessary is an understanding of perhaps nine phases affecting tractor upkeep and operation, plus the ability to follow through with a few relatively simple maintenance steps. The latter, it might be noted now, will actually save time by preventing premature failure of parts.

These nine phases are:

1. Lubrication of the tractor.
2. Care of the cooling system.
3. Care of tractor fuel.
4. Care of allied equipment.
5. General operation.
6. Operation in cold weather.
7. Operation in mud and water.
8. Day by day care.
9. Storage.

Lubrication Most Important

We have listed lubrication first. It's most important of all maintenance steps; tractor operators are conscious of this, yet it's probably the most neglected of all phases. Because the tractor mostly operates in dusty surroundings, the crankcase lubricant should be changed frequently. Remember, dust is an abrasive. With improvement in diesel engine oils and general use of the oil filter and oil cooler, the contractor may safely use the lubricants much longer than formerly. This does not mean, however, that oil changes can be overlooked. Know the factory recommendations and follow them.

Selection of the proper grade of lubricant is important. Most oil companies produce a special diesel engine lubricant. Consult the published instructions of the manufacturers for suitable S.A.E. grades to be used under various conditions. For example, an S.A.E. 20 oil may be the proper lubricant under normal conditions, while for below-freezing temperatures an S.A.E. 10 grade may be the recommendation. It is a good rule to stick with the recommendations made by the equipment manufacturer. They were not only developed by sound engineering observation, but the maker has only one object in making them: to aid you in obtaining the best results with machines bearing his name.

When you drain your oil, do it after a running period—preferably at the end of a shift. The oil will be warm, and impurities will be suspended in it. After the machine has stood idle for a time, some impurities settle and will not drain off.

Use pure mineral transmission oil. This type of lubricant is free flowing and non-channeling. If the temperature is higher than 32 degrees F., it is probably advisable to use S.A.E. 90 or 140. At temperatures below 32 degrees, use S.A.E. 80 if it is obtainable,

2. The hydraulically operated 'dozer requires special maintenance methods. Watch the cylinder for traces of oil; if you find them, renew the packing

or dilute the heavier oils with kerosene.

Lubrication of Track Mechanisms

Track mechanisms take a severe pounding on a tractor, and because abrasion exacts a heavier toll here, there is an even greater need for lubrication. On track rollers, carrier rollers and idlers, use the regular tractor chassis lubricant made by most petroleum producers. It is stringy and tacky and will stay put longer. However, if you're all out of it and a new supply is not immediately available, use S.A.E. 80 or 90 transmission oil. In sub-zero weather, crankcase lube oil may be used, although it will be necessary to employ it more frequently. In all cases it's a sound rule to lubricate these parts often, judging the frequency of lubrication by the type of work being done and the abrasive nature of the dust or mud encountered. Under some conditions, 5-hour intervals between lubrications of the idlers and rollers pay big returns in trouble avoided.

Necessity for care of the chassis points goes almost without saying. Tractor manufacturers have streamlined the task by standardizing the greasing interval at eight or ten hours. Some contractors have their lube truck on the job at the end of the shift, and hit each point every seven hours. Use the same chassis lubricant as on the track assembly.

Do Not Neglect Air Cleaner

The air cleaner is often neglected, but its function is vital: to keep abrasive substances from highly finished surfaces of the engine. It may be necessary to wash the air filter every five hours or possibly only every 60 hours. Again, it depends on the job conditions. But in replacing the oil in this unit, don't use the regular diesel crankcase lubricant. It may foam and defeat its purpose. The proper type is regular automobile crankcase lubricant, of the proper S.A.E. rating to suit the temperature.

Already you've undoubtedly felt the bite when it comes to replacing tractor parts, such as sprockets, idlers and castings. The radiator of a tractor contains a large amount of zinc and brass—both metals more scarce by far than steel. So the cooling system should take high priority in your maintenance program.

Care of Radiator

Fortunately, it's a simple matter to prolong the life of the radiator. Drain it occasionally at the end of a shift, when scale and rust are in suspension in the water. Then, at more infrequent intervals, follow this procedure:

With the engine hot, drain out the water. Then pour in an amount of kerosene equal to one gallon for each ten gallons of water the cooling system normally holds. Next, make up a solution of one-half pound of washing soda to each gallon of water and fill the system. Run the engine for half an hour, drain and flush.

If done regularly, this procedure will keep the radiator and engine jackets clean and contribute appreciably to efficient operation of the tractor. Another thing to watch is the fan belt adjustment.

Fuel Filter

You can do two things in connec-

3. Many of the more progressive contractors bring their lube truck to the job at the end of each shift. This rig, owned by Guy F. Atkinson Co., Coast contractors, is capable of lubricating a number of trucks at one time

tion with tractor fuel that will add hundreds of hours to the career of your "cat." First, watch the fuel filter. If it's the absorbent type, drain the sediment every 60 hours and reprime it. Then, whenever the need is indicated by decreased fuel flow, replace the filters. If your tractor has the metallic type of filter, wash it out every 60 hours.

The second thing is proper storage. Being heavier than other types of fuel, distillate picks up foreign matter more easily and precipitates it less readily. Dirty fuels are attributed by petroleum experts to be one of the most prolific sources of trouble in a diesel engine. Foreign matter damages the delicately machined fuel injection system, attacks the finish of highly polished cylinder walls, and grinds away the metal of many another important engine part.

Storing Diesel Fuel

Perhaps the best way of storing diesel fuel is in a large stationary tank. Such a container should be of welded non-corrosive material—copper bearing steel is highly satisfactory. Never use a galvanized tank, as impurities in the fuel may react with the zinc plating, causing formation of harmful compounds. Mount the container on a solid base, sloping longitudinally about one-half inch to the foot. Provide a drain cock at the lower end.

The outlet pipe from which the fuel is pumped should terminate not less than 3 or 4 in. from the bottom of the tank, so impurities which have precipitated will not be pumped out. The inlet opening should be equipped with a screen, and a manhole should be provided for actual inspection. A conventional hand pump can be installed.

In filling the tractor tank, always clean off the fuel cap, and never set it on the ground. When the container's contents drop low, pump slowly to avoid stirring up sediment. Then, when the fuel level reaches the bottom of the outlet pipe and pumping action ceases, drain out the bottom four or five gallons and discard them. They only cost you a few cents and they can cause hundreds of dollars worth of damage to your tractor.

Periodically, the tank should be scrubbed out. You'll be surprised at the amount of sediment in the bottom.

Even more care must be exercised if the fuel is to be handled in drums, for the possibility of contamination is greatly increased. A few simple rules that will pay dividends are: For gravity discharge, mount the drum on a rack, resting on its side and tilted slightly away from the outlet cock. This permits sediment to settle away from the outlet. If you use a pump, stand the drum on end and allow the outlet pipe to terminate a few inches from the bottom of the drum.

As with the larger container, don't

4. Reverse the cutting edge of the 'dozer before it wears through and damages the bowl. The edge can be replaced, but the 'dozer proper is hard to get these days. If the blade is used for a pusher, weld a wear plate at the point of contact

5. Operating in ice at sub-zero temperatures, the tractor demands special care. Lubricants should be of lighter viscosity, and the cooling system should be protected

use the remaining few gallons in the bottom of the drum. You can pour them into a drum reserved for settling, and after it's full and sufficient time has elapsed for settlement, the clean fuel on top can be used.

Maintenance of Bulldozer

Under the heading of tractor equipment comes a host of units. Scrapers, loaders, cranes, rippers—all can be listed, but to cover maintenance of each would require more space than available. Two units, however, are so commonly used as to be almost integral parts of the tractor: the bulldozer and the power control unit. Hence a few words about each seems fitting.

Bulldozer sheaves should be greased at the end of each shift. Much time and money can be saved in replacement, and the sheaves will last longer, if the more flexible and longer lasting preformed wire rope is used. Preformed rope resists rotating or squirming in sheave grooves, its tendency being to run straight and true. This eliminates the grinding action that prematurely wears both sheave treads and rope. Also, turn the reversible cutting edge before the bottom of the bowl starts wearing. The blade is replaceable, but the 'dozer proper can be ruined prematurely if you forget this point. On the angledozer, tighten all capscrews once a day to maintain its rigidity and prevent wear. If you're using the blade as a pusher, weld or bolt a wear plate at the point of contact.

All bearings on the power control unit should be kept tight. The seal leathers should be maintained in a soft and pliable condition by applying a special oil developed to take the place of the older neetsfoot oil. If this is not available, kerosene is an omnipresent and satisfactory substitute. Cable with a wire rope center, which gives more strength for the one-half inch diameter commonly used on tractor equipment, is most satisfactory. It has another advantage in that it withstands compression without deforming. It is, of course available in the preformed type of wire rope. The preforming process overcomes the disadvantage of stiffness ordinarily found in the independent wire rope center construction, and this type is being used exclusively by many of the more progressive contractors.

Preformed rope is almost requisite when the power control unit is used to control a carry type scraper. Ordinary cable has a very short life over the small sheaves and reverse bends; preformed, which resists bending fatigue to an extraordinary degree, saves time and money otherwise spent in reoutfitting.

Rules for Saving Cable

Many hundreds of feet of cable can be saved on the tractor by paying attention to a few simple details. Don't let it kink when you install it; early failure is sure to result. Watch the way it spools on the drum, and avoid criss-crossing. Reverse the ends as often as possible to distribute the wear. Another good idea is to cut off a couple of feet occasionally, which likewise evens out wear. And lubricate it with special cable lubricant when it gets bright.

It's common for cable users to feel that by installing a larger rope they can increase its life. This is a dangerous practice, as it may result in rim cuts and squashing of the cable as well as damage to the sheave. Fit the cable to the sheave.

Special Points to Watch on Hydraulic Equipment

There are some special points to watch on hydraulic equipment. First, of course, the oil should be of the proper viscosity. Follow the manufacturer's recommendation, and don't fail to change it frequently. The air cleaner should be changed regularly, too. And, with rubber as scarce as it is, special attention should be paid to the hoses. See that they take a natural curve, and that they don't kink or rub against any other part. Watch for the tell-tale collection of dust on oil that indicates a loose or worn fitting, and correct it immediately. Check the rod wipers frequently. A worn-out packing will carry dirt into the cylinder with obvious results. If any oil can be detected on the exposed rod in its advanced position, the packing is deficient.

If your hydraulic mechanism is equipped with leather bushings, check them once in a while. When a tractor has been stored for a considerable period, the cylinder leathers may have dried out, in which case their life can usually be restored by soaking them in kerosene or the special leather oil mentioned above.

These points are all important in keeping the tractor and allied equipment going. There are, however, a number of other methods, principally in the field of actual operation, which will keep 'em rolling more hours. They will be outlined in the next article.

Types of Materials Limited for War Construction Projects

Builders with project ratings under Order P-19, serial numbers above 81, were restricted in their use of the ratings in Amendment 1 to the order announced July 17. The order as originally issued did not limit types of material builders could obtain for war construction projects.

The July 17 amendment limits builders to materials which are to be physically incorporated in the projects and to certain "expendable material" consumed in construction.

"Expendable material" is defined as "materials which will be wholly consumed at the location and during the construction of the project, including (but not limited to) explosives, abrasives, perishable tools, scaffolding, and the like. 'Expendable material' shall not be deemed to include fuel, construction machinery, or repair parts for construction machinery."

Roadside Development and Overhead Lines

By GEORGE D. BLAIR
Forester, Consumers Power Co.
Jackson, Mich.

AS forester for many years of a progressive electric utility company in Michigan, I have found the work of coordinating the best interests of public thoroughfares and overhead electric lines intensely interesting. In this period, dating back to 1922, we have learned many things. During the period, our job has been to supervise the maintenance of tree clearances along existing overhead structures, of which we now have some 26,000 miles, and to aid in planning, also building, new lines. In the course of these activities, we began at an early date to study the basic requirements of roadsides and, more particularly, of trees. We discovered several physical and human principles which appear to be controlling factors if a good balance of desirable results as measured by satisfactory operating conditions, pleasant relations with the public, and economy are to be obtained. I hope to explain these principles and, in a small way, convey some of my personal belief that there is much possibility for improvement of the relationship between utility pole lines and public thoroughfares.

Wires above a roadside planting of hard maples. Adequate pole heights permit satisfactory and economical maintenance of clearances and good looking trees

Machine Problems

Our early study of field condition, carried on over a period of years in cooperation with several county and state highway representatives, revealed that existing public thoroughfares would be required to carry in the future an increased burden of public services and also that all new streets and highways should be designed and built to meet these greater requirements. Further, the study showed that for best results in providing service, the location of utility structures should be coordinated with all other highway uses, present and future, rather than placed in any spot which happened to strike the fancy of utility men or others. This seemed like a workable approach as it recognized that overhead lines are but one of the public facilities to be provided for on street and highway right of ways, and that in the final analysis travel, drainage and safety must come first. With this thought, no one should dissent, if applied practically in the field, not even a utility man, as all of us constitute the general travelling public.

The trend toward more roadside development and maintenance during the last decade has caused new problems to arise in the allocation of right of way space for various uses. I believe the situation should be considered a mutual problem of public thoroughfare and public utility people. The services supplied by each are essential public services and must continue. The general public pays the cost of each, and here is an excellent place to mention the fact that telephone and electric rates are based upon construction, maintenance and operating costs.

Analysis of the Situation

In analyzing the situation, one realizes that many of the older highways in this country do not have sufficient right of way width to accommodate the increased basic needs of travel, drainage, safety and public services. Many of these roads are now distinctly over-burdened and should not be considered for any roadside tree planting until additional right of way is secured. On many of these highways are existing utility lines often badly exposed to traffic hazards and in some cases of old design not suited to their location when gauged by present-day standards. Here is a real problem, a condition where roadside men and utility representatives can cooperate to the advantage of each.

Along these older roads, appearance and safety can be enhanced by readjustment of line location, frequently as to pole heights, and the removal of unsightly trees. Owing to deterioration and inadequacy, replacement of poles is a routine practice with utility companies, and when such replacements are being planned, changed field requirements can most economically be allowed for. I think many utility companies welcome constructive suggestions and aid from street and highway representatives looking toward improvement for mutual benefits, and I further think that such representatives have a right, morally when not legally, to expect full cooperation in all matters pertaining to the location and maintenance of utility structures.

When new or additional highway right of ways are secured, they should by all means be sufficiently wide to accommodate all needs with some attention to the future. In determination of this, also the route, the roadside man should play an important part along with highway designing engineers and maintenance men. If this is done, followed by coordination of proper design to the travel strip,

bridges, drainage and roadside, the foundation for many years of useful, adequate service to all interests of the public is assured. During design, provision can be made and space allocated for both overhead and underground utilities. Where this has been done, street and highway departments have something to offer public utility companies and are in an excellent position to insist upon an orderly arrangement of all highway facilities. This orderliness reduces physical conflicts along the right of way. New right of ways offer the roadside man a golden opportunity to establish proper basic conditions, and in my estimation the public agency that is failing to do this is not fully competent. The reason we have much congestion on many roadsides today is that we have tried to place too much in too little space. If this condition is avoided in the planning and building of new roads, then and only then can full roadside development to adequately protect and maintain highway investments and better serve the general public be carried out.

Pole and tree line with sufficient separation for good line operating condition and natural tree development

Tree and Wire Relationship

As a rule, public authorities consider utility structures as a part of public thoroughfares. They realize that in most cases streets and highways offer the only routes to deliver water, gas and electric service from plant to customer. In Michigan public thoroughfare authorities have the legal right to regulate the use of streets and roads by utility companies but not to prohibit such use. This arrangement has generally worked for mutual benefit. Poles are installed at specified distances from the highway center line, and vision areas for safety purposes are given consideration. Private driveways, ditches and culverts are not obstructed, guys are placed to cause least interference, tree trimming and, where necessary, removals are done under written permits and in accordance with practical specifications governing quality and quantity. We are fortunate in our state to have excellent state and county highway people. As a rule they appreciate that public utility facilities are placed in public thoroughfares by necessity rather than choice and they lead in joint efforts for improvement.

Wherever feasible, it is wise to avoid placing wires directly over trees especially those species of upright form, as such a position usually detracts the most from tree appearance. Also this position for wires usually is the most expensive to maintain. There is no use fighting Nature's plan of maximum growth, which is upward, if same can be avoided. When wires can be located under or along the side of tree crowns, less expense is required to secure and maintain clearances, also there is less interference with tree welfare.

Some conductors, such as those carrying important power loads and high voltage transmission lines, must be located above trees to secure maximum protection. City and village parkways are frequently not wide enough to permit latitude in placing poles to avoid carrying wires over tree crowns. In rural areas, many overhead lines have been located on private right of way adjacent to public thoroughfares to the advantage of all interests. This procedure is rarely practicable under urban conditions as economy and availability of private property for this purpose must always be considered.

A careful study of tree species characteristics will reveal that they have basic differences of growth habits and shape which should be considered in locating and maintaining overhead lines on streets and highways. Owing to the American habit of seeking variety, tree species and size may vary greatly in a single urban street block. This situation is different from dealing with a one-tree species and size condition, but field examination usually reveals the best balance of pole height and line location to follow. Economy is a watchword with most utility companies and frequently expense can be saved not only at the time of construction but repeatedly in future years if overhead lines are properly located with respect to trees.

Existing Conditions

I have pointed out some basic conditions to be observed in the installation of pole lines on public thoroughfares. Undoubtedly many have been wondering how this applies to established lines. You may have in mind some locations where wires for years have suppressed the growth of individual trees to a point of unsightliness or perhaps some tree planting is planned on narrow roadsides completely occupied by overhead wires. There are many such cases all over the country, and utility companies are just as desirous of an economic practical solution as street and highway people. As previously mentioned, there appears to be no quick or complete practical solution. There are, however, several means of gradual amelioration.

As an indication of the electric utility industry's attitude, I should like to mention that the Edison Electric Institute has been making a wide study of tree clearance conditions. In recent years a Tree Clearance Subcommittee has been functioning with the following expressed objectives:

1. Find the most satisfactory and equitable solution of the tree interference problem.
2. Aid in shade tree preservation.
3. Reduction of costs due to trees in the construction, operation and maintenance of overhead lines.
4. Standardization of line clearance practices. A great deal of useful information on field conditions has been collected and analyzed. From this data, a set of proposed specifications governing tree clearance for overhead electric lines is being developed. After approval by the Edison Electric Institute these specifications will be distributed to the industry. They should do a great deal of good, not only in the gradual elimination of poor existing conditions, but in the avoidance of mistakes during rebuilding and initial installations of overhead lines.

How Existing Conditions Can Be Improved

We will now turn back to the question of improving existing conditions. In this the first step is to make cordial contact between highway and overhead line representatives. Each should intimately know his job, and be willing to cooperate and effect compromises when necessary. As a major requirement all tree trimming for line clearance should be done in accordance with modern approved practices and principles. Where feasible, alterations to standard line construction should be made to accommodate tree development. Side-arms or pole realignments frequently work to great advantage. The removal of unsightly, defective and weed trees also brush, often may improve roadside appearance tremendously and at the same time clear up bad overhead line hazards. These are samples of ways to bring about roadside improvements along existing highways. In planting on either new or present highways, trees should never be placed directly under established overhead lines unless the line is to be removed in the near future or adequate pole heights are present to accommodate the tree species used. With wide spacing, Norway maple and a few other species of similar spreading form habit may be planted below wires supported by 45'-50' poles without creating a future serious conflict. Many semi-trees and shrubs are suitable for such conditions.

The Future of Roadside Development

From observation and frequent contacts with improvements of roadsides, I am inclined to feel that this work has great possibilities. It appears to be a combination of engineering, landscape architecture and forestry. In the long run it must justify its existence on the basis of protecting highway investments, making maintenance economical, aiding public safety and making highways more serviceable to the general public. The attractive views, shade, and pretty flowers produced are nice, but incidental. Further, roadside development and maintenance to survive and become a permanent thing, must include all roadside areas rather than be confined to occasional spots on or adjacent to the highway right of way. The interests of abutting property owners must be fully considered at all times. Public utility companies can aid roadside development substantially and I believe will do so if educated in the same gentle manner as the general public. As owners of overhead lines, as well as citizens, they have something to gain.

1941 Pavement Construction Records in California

The annual report of the construction division of the California Division of Highways, giving details of pavement construction in 1941, is printed in the April issue of California Highways and Public Works, the official publication of the Division of Highways, Department of Public Work, of the State of California. The report prepared by Earl Withycombe, Assistant Construction Engineer, gives the following construction records for last year.

Portland Cement Concrete

The highest average daily output of portland cement concrete pavement was by Fredericksen & Westbrook on Contract 27XC7, road VII-Ven-L.A-79-C,A, Piru Creek to Los Angeles County line, where an average of 680 cu. yd. per day with a 34-E paver was maintained. E. L. Seitz was resident engineer, and W. T. Lamb, street assistant.

The average daily output for the entire state in 1941 was 460 cu. yd. as compared to 374.3 cu. yd. in 1940. The increase in output is largely due to the specified 20 per cent permissible overload in a paving mixer permitted under the new standard specifications.

The highest average compressive strength for 5-sack concrete during 1941 was 4,630 lb. per square inch on Contract 410TC2, road X-Sol-Nap-7-G,A, 0.6 mile north to 2.3 miles north of Route 208; Heafey-Moore & Frederickson-Watson, contractors, A. K. Nulty, resident engineer, and G. R. Barry, street assistant. The average for the state for 28-day compressive tests was 3,840 lb. in 1941 as compared to 4,204 in 1940.

The record for cement control was made on Contract 410TC1, Road X-Mad-Mer-4-C,A, 0.5 mile north of Ash Slough to Dutchman Creek, where the average variation was 0.62 per cent. M. J. B. Construction Company & F. Kaus were the contractors, R. H. Lapp, resident engineer, and A. J. Hull, street assistant. The average variation for the state in 1941 was 0.87 per cent as compared to 0.93 per cent in 1940.

The record for surface smoothness was made on Contract 210TC9, road X-Sta-4-A, Cer,B, Keyes to Hatch Crossing, with an average roughness index of 4.5 in. per mile. M. J. B. Construction Co. & F. Kaus were the contractors, R. H. Lapp, resident engineer, and J. C. Witherell, street assistant. The average smoothness for the state in 1941 was 7.8 in. per mile, as compared with 7.4 in. in 1940, which indicates a slight decrease in riding quality.

Asphalt Concrete

The highest average daily output of asphalt pavement tonnage was laid on Contract 24TC8, road IV-S.M-2-RdwC, Broadway to Charter Street, where 747 tons per day were averaged by Piazza & Huntley & Trewhitt, Shields & Fisher; L. G. Marshall was resident engineer, and G. A. Wildman, street assistant. The average daily output for the state was 508 tons in 1941 as compared to 541 tons in 1940.

The highest stability of surface mixture was obtained on Contract 27VC5, road VII-L.A-9, G, Foothill Boulevard, Los Lomas Ave., to Irwindale Ave., with an average of 47 per cent; J. E. Haddock, contractor, J. R. Rubey, acting as resident engineer, and street assistant. The average for the entire state was 37 per cent in 1941, as compared to 37.4 per cent in 1940.

The record for surface smoothness was secured on Contract 26TC2, VI-Fre-4-A,Fowler, Selma to Fowler, where the average roughness index was 9.2 in. per mile. Piazza & Huntley were the contractors, F. W. Howard, resident engineer, and T. W. Voss, street assistant. The average for the entire state in 1941 was 14.9 in. per mile, which is the identical figure for the preceding year an unusual coincidence in surface smoothness records.

Bituminous Treated Surfaces

The record for surface smoothness on plant-mix of 8.0 in. per mile was obtained on Contract 42WC3, road II-Plu-21-G, Beckwourth to Edes Ranch, by Poulos & McEwen, contractors, with G. Sundman, resident engineer. The average for the entire state in 1941 was 19.3 in. as compared to 23.1 in. per mile in 1940.

The record for surface smoothness for road-mix was made on Contract 211XC1, road XI-S.D-78-E, Oak Grove to 0.8 mile north, with 8.6 in. per mile; Roland T. Reynolds' contractor, F. W. Stewart, resident engineer. The average for the entire state in 1941 was 29.4 in. as compared to 49.2 in. in 1940.

Conserving Truck Tires

THE Maintenance Department of the North Carolina State Highway and Public Works Commission has issued the following instructions for the guidance of its employees:

In order to properly maintain roads maintenance forces must keep equipment rolling. Hence the conservation of tires is vitally important. Observe the following load and speed limitations and see that the rules for conservation of tires are carried out.

Load Limits

1. 1½ ton Truck:* Maximum "pay" load 5,000 pounds (32x6 8-ply or 6.50 x 20 8-ply).
2. ½ ton Pick-up Truck: Maximum "pay" load 1,000 pounds.
3. Four Wheel Drive Truck: Maximum "pay" load 4,000 pounds, single wheels; 8,000 pounds, dual wheels.
4. Trailer:** Hold maximum "pay" load to trailer capacity.

NOTE: *—Have sideboards removed from all dump bodies except where sideboards are necessary on trucks used in spreading stone or sand.
**—If trailer is home-made, the division mechanic will furnish the capacity in accordance with the tire equipment and other limitations.

Load restrictions are based on manufacturers' rated tire capacities. When tires are in poor condition, the maximum load should be restricted further.

Speed Limits

1. Heavy Duty Low Bed Trailer (10 tons or more) .....15 miles per hour
2. Truck with Semi-trailer .....30 miles per hour
3. Four Wheel Drive Truck .....25 miles per hour
4. 1½ ton Truck.....35 miles per hour
5. ½ ton Truck.....35 miles per hour
6. Car .....40 miles per hour

Note: Above speeds are maximum allowed. Reduce actual travel speeds further when permitted by circumstances or when warranted by load or road conditions.

Rules for Conserving Tires

I. Care of Tires

1. Have operator and foreman informed as to correct air pressure for tires on equipment they are using, and have them maintain this pressure. Proper inflation, freedom from overloads, and other precautions are more important with recapped tires than with new tires. Recommended pressures are made to fit average conditions, but the most efficient pressure may vary with load, temperature, and road type and condition. The pressure which gives the least tire heat is the most efficient.

2. Check tire inflation at least twice each week and maintain correct pressure. Each shop and sub-shop has an air compressor and each mechanic has a tire pressure gage. Either over-inflation or under-inflation causes extra tire wear. A pound or two of over-inflation is better than the same amount of under-inflation. Under-inflation is the most frequent cause of tire damage, it causes ply separation, sidewall breakdown, and heat generation.

3. Feel your tires during long runs. If they are heating excessively, the air pressure should be increased.

4. Examine tires regularly (at least once a week) for cuts, bruises, nails, etc., and have the necessary repairs made.

5. See that the new or lesser worn tire in a dual combination is placed on the outside wheel (naturally this will put the more worn tire or tire with smaller diameter on the inside, that is on the wheel nearest the center of the truck).

6. Place valve stems of the two tires in a dual combination on opposite sides of the wheel so when the valve in one tire is at the top (of the wheel circle) the valve in the other tire will be at the bottom (that is 180 degrees apart). This practice improves the balance of the combination.

7. Keep rocks, sticks, mud or other material from between dual tires.

8. Criss-cross position of tires every 4,000 to 8,000 miles, or when they show uneven wear. The rear tires get more wear than the front tires and the tires on the right get more wear than the tires on the left. The relative wear is as follows: Right rear, 38%; left rear, 29%; right front, 19%; left front, 14%.

9. Keep valve caps screwed down securely to prevent dust or grit from getting into valves, and to keep air from leaking out of tube.

10. Clean off top of valve and release a small amount of air before applying air hose so that foreign par-

ticles will not be blown into the tube.

11. When changing a tire be sure that the lock-ring is not defective or sprung too much, and that it is properly fitted and secured before applying air.

12. When installing new or repaired tube inflate to a pressure of only five or ten pounds to form tire. Tap lock-ring lightly all around, to make sure the ring and tire are properly seated. Increase pressure five or ten pounds and again tap ring lightly to be sure the ring remains properly seated.

13. Be certain that the inside of a casing is dry before the tube is installed.

14. Avoid using a loose boot in a good casing except in an emergency and then only until it can be replaced.

15. Have tires checked for balance at least every 8,000 miles or when they show uneven wear.

16. Keep front wheels at proper "camber" and "toe-in." Where local highway shop cannot properly check this adjustment, request the Equipment Department to send the vehicle to an authorized dealer or "tire and rim" shop.

17. Where tires are subjected to heat, as on sand driers, have tires removed and stored while heating operation is in process.

18. See that correct width rim is used on all tires. There is a specified rim width for each size tire. The correct combination of rim and tire will give better tire life.

19. Have foreman instruct operator in proper manner to start and stop motor vehicles so as to avoid unnecessary "jerk" in starting and to avoid sudden and unnecessary use of brakes.

20. Pay special attention to roads leading off highways to quarries; pits, creek banks, or other "off-the-highway" points. These roads should be as smooth as practical and free from loose stone.

21. Avoid operating trucks in streams. The uncertain stream bed might have projections that will damage tires. The water and water-borne sand will get into brake linings, universal joints, and bearings.

22. Avoid spinning tires on ice, in mud, in sand, or under any other conditions. A spinning wheel burns off rubber.

23. Avoid striking tires against curbs, vertical surfaces or sharp corners.

24. Avoid rounding curves too fast and throwing excessive load on the tires on one side of vehicle.

25. Avoid running on soft or flat tires.

26. Remove anti-skid chains when not required.

27. Avoid running with broken cross links in the anti-skid chains.

28. Avoid locking brakes and sliding tires.

29. Have brakes checked at least every thirty days. When the brakes are out of adjustment or the drum has a flat spot the tread on the tires affected will show uneven wear.

30. Store pneumatic tired equipment in the shade when possible. Exposure to sunlight causes hardening of the rubber covering on the sidewalls of the tire. The defects caused by such hardening become apparent as checking and easy abrasion after tire is recapped.

31. Used tubes should be stored in a cool, dark place, with a small amount of air left inside the tube to serve as a cushion. They should not be piled up or placed under any weight that might crush the edges. Before storing, oil or grease should be washed off with high-grade gasoline. Tubes should not be carried in the car or truck in a way that will expose them to oil, grease, or abrasion.

Storage

1. Equipment that is stored for long periods of time, 60 days or more, should be placed on blocks so that the weight will be taken off of the tires. This will include bituminous distributors, rotary brooms, retread pavers, etc., that are stored during the winter months.

2. See that equipment such as graders, tar kettles, patch rollers, mowers, etc., are stored so that tires will be protected from weather and from theft.

II. Tire Replacements

1. Remove tires after the tread is worn smooth. Do not wear through tread to the breaker strip (the breaker strip is the fabric just under the rubber tread). This practice is advocated so that the tire will be better suited for recapping or retreading. However, tires are suitable for retreading even though the breaker strip is showing.

2. See that used or old tires are properly stored out of weather and that they are recapped or retreaded when the tire carcass is of sufficient value to warrant such treatment.

3. Require operator to turn in an old tire for each new tire issued.

4. When equipment is junked or dismantled for parts the tires should be removed and properly stored.

III. Tire Service Records

1. The Equipment Department has records on the tire cost of each vehicle. This information is available for each Division Engineer and Department Head so that he can determine whether operators are taking the proper care of tires. Analyze tire cost data and take the necessary steps to insure correction of any abuse.

2. Require operators to record speedometer readings and dates when tires are replaced.

Pneumatic Tire Data—Inflation, Rim Size, and Load Table

I. Truck Balloon Tires Including Dual Marking for High Pressure Tire Replacements.

Size	No. Plies	Rim Size	Loads at Various Inflation Pressures 40	45	50	55	60	65	70	75	80
6.00-16	6	5"	1130								
6.00-20	6	5"	1225	1325	1400						
6.00-20 (30x5)	8	5"			1400	1475	1550	1625	1700		
6.50-20 (32x6)	8	5"			1700	1775	1850	1950			
7.00-20 (32x6)	10	6"				1950	2050	2150	2250		
8.25-20*	10	7"	2175	2325	2475	2600	2750				
9.00-20 (36x8)	12	8"						3450	3600	3725	3850
9.00-24 (40x8)	12	8"						3925	4100	4250	4375

II. Balloon Tires for Earth Moving Vehicles Maximum Speed 10 Miles Per Hour.

12.00-20	14	11"	5300	5670	6030	6400
12.00-24	14	11"	5950	6360	6780	7190
16.00-20	16		9420	10110		

III. Passenger Car Tires

6.00-16	4	30 pounds maximum.

Note: Underscoring denotes maximum recommended loads and recommended pressure.
*—8" rim on 8.25-20 tires will give better mileage.

Snow Removal in Oconto County, Wisconsin

By C. L. FOLEY

County Highway Commissioner, Oconto, Wis.

WINTER maintenance in Oconto County is no doubt like all localities in the snow belt: Preparedness in the fall and plenty of action when the snow flies along with some grief when the equipment doesn't function properly. It is, however an interesting job and when your roads are all open and you have kept traffic moving, you can really feel satisfied that the job was done well, which of course, is some satisfaction, particularly so, if the public is satisfied and that you know they are pleased.

In the fall we shape up the shoulders, see that all culverts are clean in preparation for the next spring thaw, cut weeds and brush to prevent drifting and erect snow fence where necessary. We check over and repair all snow removal and ice prevention equipment, mount the snow plows and then hope it snows, so we can keep our organization on the pay-roll. The average snow fall per year in this locality is about 70 in.

Widening with tractor plow

Equipment Used

We maintain 148 miles of state, 200 miles of county and 910 miles of town highways, a total of 1258 miles with the following equipment:

- 5—1½ ton trucks with one way plows
- 9—5-7½ ton trucks with V-plows and wings
- 2—8-10 ton trucks with V-plows and wings
- 3—70 H. P. tractors with V-plows and wings
- 1—60 H. P. tractor with V plow and wings
- 4—66 H. P. motor graders with V-plow and wing
- 29 miles snow fence.

All large trucks and tractors are equipped with auxiliary fuel tanks and operate 100 hours without refueling. Greasing is done in the field during severe storms with a truck equipped with air compressor. This truck also

Snow removal equipment in county highway department shops

County highway shop and garage from which the bulk of the snow removal equipment operates

Roadway plowed and widened with 5-7½ ton plow, and cleaned up with power grader

Traveled way widened with tractor plow and cleaned up with small 1-way plow

carries oil and some repair parts, including various bolts, nuts, etc., and can justly be called a small service station on wheels.

Route System Employed

Our state and county highways are under a "route system" which is divided into 12 sections and six points of operation, namely Lakewood, Mountain, Hintz, Spruce, Sampson and Oconto. One large truck and tractor are placed at Lakewood, one large truck at Mountain and large power graders at Hintz, Spruce and Sampson. The balance of our snow removal equipment operates out of Oconto which is the main point of operation. All instructions are given from the Oconto office. Equipment that is not required on state and county roads is placed on town roads and as each unit used on the state and county system complete their respective routes they are placed on town roads. All operators of equipment are given typed instructions of the roads to plow and a copy of this is kept in the office for progress records and other information, so that we know where various units are at all hours of the day and can locate them quickly for sickness and other emergency calls.

Personnel for Winter Maintenance

The operator of each unit of equipment reports by phone every six hours what progress he is making, amount of snow and weather conditions. Also where the relief crew will meet him to report for duty. We change crews every 12 hours. The personnel required for our winter maintenance activities is as follows:

1 Highway commissioner
1 Clerk
1 Stenographer
1 Patrol superintendent
1 Chief mechanic
4 Mechanics
1 Blacksmith

Line-up of snow removal equipment of Oconto County Highway Department

1 Stock room clerk
1 Shop janitor
2 Grease truck drivers
1 Fuel truck driver
52 Equipment operators
48 Helpers.

DATE_____

TRUCK NO. _____

OPERATORS: _____ _____

_____ _____

HAS YOUR EQUIPMENT BEEN CHECKED FOR OIL AND GREASE TO-DAY?

ROUTE:
22 west to Shawano County line, then back to "B". Plow "B" from 22 north to Klondike and east to Marinette County line and then back to 22.

CLEAN ALL RAILROAD CROSSINGS
CALL OFFICE WHEN YOU COMPLETE YOUR ROUTE

Sample of instructions given to equipment operators

Methods of Truck Maintenance in England

Great Britain has had nearly three years of war, but most of her trucks and buses are still running. Despite far less ample supplies of spare parts than operators had at their command in this country when the United States entered the war, and despite the fact that many vehicles and stores of spare parts were destroyed in air raids, Britain has kept her highway transport facilities in operation.

In the belief that some knowledge of how this has been accomplished would be of real value to truck and bus operators in the United States, the Transportation and Maintenance Activity Section of the Society of Automotive Engineers made a study of maintenance methods being used in England.

This study was made to further the preventive maintenance program of the Office of Defense Transportation and has been approved and distributed by the Vehicle Maintenance Section of the ODT's Division of Motor Transport.

The SAE found that, as might be expected, the British have developed many methods for reclaiming and rebuilding available used parts in order to make the most of existing equipment. The salient features of preventive maintenance as used in England follow:

Pistons.—Pistons are removed at predetermined periods for inspection. Worn ring grooves are turned out for oversize width piston rings. Worn or broken ring lands including top land in aluminum pistons are welded solid and re-turned. Skirts are expanded by any one of several American processes. Tin plating has been used to prevent seizure of cast iron pistons. Badly worn piston pin holes have been bored out and fitted with phosphor bronze bushings and in some cases, pins have been oversized by chromium plating.

Crankshafts.—Both chromium plating and metal spraying have been used. There is one complaint that journals are not reliable to less than .002 in tolerance which presents difficulties in line boring. This would indicate that British machining is not up to American standards. Some operators use standard undersizes before building up the crankshaft while others keep shaft to standard to eliminate the necessity for several undersize bearings.

Camshafts.—One firm reports that it applies stellite to worn cams and then grinds them with a machine of its own design.

Valves and Valve Mechanism.—Large valves have been turned down and used to replace those of smaller size. In some cases, valve stems have been brought up to standard size by chromium plating and in others, the valve guides have been filled with bronze welding rod and rebored. Some valves have been refaced with stellite. Similar treatment has been successful on valve tappets. Chromium plating has also been used on tappets. Chrome plating has also been found useful on rocker arm shafts.

Clutches.—Clutch faces on the flywheel have been repaired by stellite deposition. There is a record of one operator straightening buckled clutch plates by heating them with a gas ring and subjecting them to pressure between two cast iron plates. Chromium plating has been used successfully on clutch discs. Electric welding has proved successful on toggle levers. Nickel and chromium plating, as well as deposition by electric welding, has been successful on a number of transmission shafts and other parts such as shifter forks.

Differential.—Metal spraying has been used to rebuild differential yokes at the surface that holds the differential bearings. This is difficult to machine so that the ring gear remains square with the carrier but it has been done. Some firms have been successful in building these surfaces up with electric welding. Sleeves on the inside of differential cases have been built up by oxy-acetylene welding and then bored out. Spring pads have been built up by electric welding.

Springs.—Broken main leaves have been converted into intermediate leaves where breakage has occurred adjacent to the spring eye. Shackle pins have been chrome plated. In addition to building them up to standard size, this has doubled the life of the pins by providing increased resistance to wear and prevention to rusting. Some pins have been machined down and fitted with undersize bushings.

Wheels.—Where ball or roller bearings have become loose in front wheel hubs, bronze welding has been used to build up the internal areas so they can be rebored. Some hubs have been chrome or nickel plated.

Front Axle.—Chrome plating has been used to build up king pins while one operator has machined his king pins down and fitted undersize bushings. Another grinds king pins down to a standard undersize and then builds them up to the regular standard with welding material after subsequent use.

Axle Shafts.—Axle shafts splines are built up and filled in with welding. The splines are then milled into the shaft in such a position that the driving face is of parent metal. Splines have also been built up with chromium plating. Keyways have been reclaimed with bronze welding.

Cylinder Heads, Cylinder Blocks and Crankcases.—Cylinder heads have been salvaged and leaks stopped by welding, metal spraying and cold welding. Welding and cold welding has also been successful on cylinder blocks. Valve seats have built up by welding stellite onto the worn valve seat. Both cast iron and aluminum crankcases have been successfully welded. Minor cracking of blocks and heads as a result of leaking head gackets has been cured with bronze welding.

New Jersey Highway Employee Must Not Accept Gift

The State Highway Commission of New Jersey has issued the following order:

It is hereby ordered, that employees of the state highway department shall not accept gifts or gratuities of any kind from any contractors or other parties doing business with this department. A copy of this order is being mailed to all such concerns and individuals.

The Borrow Pit

¶ Come shed a tear for Mary Doe,
Who died of shame, disgraced;
Who caused her boss unending woe,
His faith in her misplaced.
For Mary was a reckless sprite
Fly in official ointment—
It was a sorry day she took
Probational appointment.
And ere she left this vale of tears,
I shudder to confess,
A letter that she wrote—I fear
Official business—
Got signed and mailed before 'twas known
The flaw that lurked thereon.
Careers lay shattered right and left
From here to Washington!
When every check had been applied
Down to the last initial,
They found a *pithy paragraph*
That simply warn't Official!

MORAL

When you can say it with a blank,
Oh never write a letter;
But if you must, then make it terse,
And if it's dull, it's better.

—*M. Knowles in The Montana Centerline.*

• •

¶ Women's faults are many;
Men have only two:
Everything they say,
And everything they do.

• •

¶ "Look at that little midget across the street!"

"Yes. His father was a Scotchman."

• •

¶ Check this one if you're an easy mark: At Panama the sun rises in the Pacific, sets in the Atlantic.

• •

¶ Father (facetiously): "Don't you think our son gets his intelligence from me?"

Mother (likewise): "He must have. I've still got mine."

• •

¶ There should be some kind of a service stripe for the young Negro draftee of the 50th training battalion who brought his Lieutenant Colonel up with a start one night, when on guard, with the challenge: "Halt! Look who's here!" — *The Yellow Strand.*

• •

¶ Johnny, give the definition of home."

Johnny: "Home is where part of the family waits until the others are through with the car."

¶ Taxi Driver: "I take the next turn, don't I?"

Voice from rear seat: "Oh, yeah?" —*The Yellow Strand.*

• •

¶ "What's repartee, Dad?"

"Repartee, my boy, is what a man thinks of on the way home."

• •

¶ "What makes people walk in their sleep?"

"Twin beds."

• •

Teacher: Willie, how do you define ignorance?

Willie: It's when you don't know something and someone finds it out.

• •

¶ A southern sportsman, against his better judgment, loaned his champion Irish setter to a visiting New York executive. The host had to go into town to attend some business. When he returned home late that night he asked the visitor how he liked the dog.

"Well" said the man from New York, "we didn't get a hundred yards away from the house till that dog stopped with his tail pointed straight out, one forefoot raised and his nose pointed toward a clump of grass. I had to kick hell out of him before he would go on and hunt."

• •

¶ *Science Prof:* What happens when a body is immersed in water?

Coed: The telephone rings.

• •

¶ There once was a lady named Eve,
Who caused husband Adam to grieve,
When he asked where she's been,
She replied with a grin,
"I've been absent without any leave!"

• •

¶ *Landlady* (in hall talking to gal): I thought I saw you taking a gentleman up to your apartment last night, Miss Smythe.

Miss Smythe: Yeah; that's what I thought!

• •

¶ "Dull party, isn't it?"

"Yes, very?

"Let's go home."

"I can't, I'm host."

¶ *Stop and let the train go by,*
It hardly takes a minute,
Your car goes on again intact,
And better still—you're in it.

• •

¶ A city girl visiting the country went to the old swimming hole and, after hanging her clothes on a nearby bush, dived in. A country lad came by and tied her clothes in a tidy knot. Emerging, the girl grabbed an old tub nearby and, placing it in front of her, accosted the lad.

"Do you know what I think?" she said furiously.

"Yes," said the lad. "You think that tub has a bottom in it, but it hasn't!"

• •

¶ Beautiful Belle (who doesn't dance so well): "Oh, what a slippery floor this is, isn't it?"

Sailor (in disgust): "No, I've just had my shoes polished."—*Mississippi Highways.*

• •

¶ Harriet — What causes petrified trees?

Jasper — That's easy. The wind makes them rock.—*Mississippi Highways.*

• •

¶ Corporal: "Why did you salute that truck driver?"

Rookie: "Don't be so dumb! That's no truck driver; that's General Hauling."

• •

¶ The man at the movie was annoyed by constant talking behind him. "Excuse me," he said, turning around, "but we can't hear a word here."

"You don't say so!" retorted the woman behind. "Well, what we're talking about isn't any of your business!"

• •

¶ "Mary, have you ever awakened in the morning with a grouch?"

"Gracious, Betty! You know I've never been married."

• •

¶ The aerodynamics of a humming bird would make the Wright brothers feel like utter failures. Its wings beat so fast, about sixty beats a second, that all one can see is a circular blur around the little body, like an airplane propeller. They can zoom straight up, come to a dead stop in midair and plump back on a twig as if nothing had happened.

What They Laughed at 27 Years Ago

(A PAGE FROM ENGINEERING AND CONTRACTING OF AUGUST 4, 1915)

The Lighter Side of Engineering and Contracting

Everything Going Out; Nothing Coming In.

MIKE KELLEY, to hear him tell it, was the most unfortunate contractor that ever scraped together a levee. Seemingly Mike roomed with ill luck and boarded with hard times. There was never a job, according to Kelley, on which he made money; he didn't even break even, he invariably lost. He always was explaining to the engineers in charge of whatever job he was on how he was losing money. Perhaps he did this to work on the sympathy of the engineer, but in any case he made it a point to tell just how much coin he had lost on every job. One engineer made notes of these trouble tales as Mike would give them from time to time, and then figured up the totals. One day the engineer came along the work and met the contractor, who promptly proceeded to spring his tale of woe. The engineer listened, then pulled a memorandum out of his pocket and said: "Say, Kelley, you must have been a hell of a rich man when you started contracting. I've jotted down the losses on your various jobs just as you gave them to me, and I find that they total over $400,000 and you claim to be still losing."

If You Smoke, Try This One.

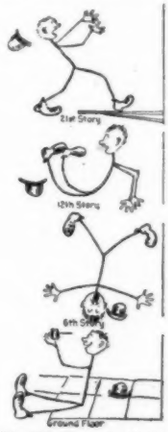
WHEN I was out on construction work I gradually acclimated myself to the smoke of 15 cigars per day, and an occasional pipe. Two things happened: I grew a nervous system where there had never been one and was forced to convert my bank balances ("one by one") into drafts to Habana. So it came about that I swore off in self-defense. One evening, a month or so later, I met an aged ex-contractor. In the course of our conversation I mentioned that I had given up smoking. "So've I," he replied. "You don't say!" I said, surprised. "Yep," he said. "I smoked since I was 16 years old. Last night as I was sitting on my porch I laid down my pipe and said to myself, 'Better quit it, Tom, or you'll get the habit' The next morning I bought a box of cigars for myself.—W. F. S., New York City.

A Little Bit Off the Bottom.

BARTSEVIOUS FLOCK, a large hearted German, had taken a ditch contract near Bucyrus, O. He generously decided that he would not be stingy with his excavation and so he made the ditch deeper than the specifications called for. The engineer on the job discovered a discrepancy and took the contractor to task. Bartsevious was surprised and hurt at the lack of appreciation of his generosity, and finally said, in justification of himself: "I make de deepenings und de videnings yust like de paper call for—only a little bit deeper."—F. L. H., Bucyrus, O.

The Jack Ass Projectile.

MANY years ago John Scott had the contract for building a railroad through a mountainous section in the West. There was an Indian reservation near the work and the redmen and the hoboes were constantly getting into fights. One day after a particularly vicious scrap the Indians got hold of some fire water and then held a powwow and a big war dance. When they had got well lit up they decided to lift the hoboes' scalps for revenge. The heaviest section of the contract was about two-thirds the way up the mountain and at this point a big side hill rock cut was being taken out with carts and mules. The men had just fixed a charge of about 200 kegs of powder when the Indians, with hair-raising war whoops, unexpectedly charged up the mountain. In the excitement someone touched off the big blast without warning. Everything in the vicinity immediately went elsewhere. Tons of big boulders were hurled down the slope. A mule and cart standing at the dump were blown end over end down the mountain side and landed right in the midst of the bewildered scalp-lifters. The Indians did not hesitate—they ran so fast their shaddows could not keep up with them. A few days later Scott met one of the Indians and proceeded to jolly him. "Red man is not brave," said the contractor; "he runs first time white man shoots." The Indian pounded himself on the breast and replied: "Injun him heap brave. No 'fraid white man if white man fight fair—shoot gun. But when white man shoot off whole Jackass right at Injun, Injun no understand. Him run."



Oh Well! I had to come down for mortar anyhow.

"Lay On, MacDuff, and Damned be He Who First Cries Hold, Enough."

TWO Irishmen of my section gang had some difference of opinion, and decided to settle the matter with their fists, first agreeing that the one who should force the other to cry "enough" should be declared the victor. Accordingly they were soon engaged in mortal combat. Finally Mike succeeded in getting Pat down, and was pounding him mercilessly, unmindful of Pat's cries of "enough!" "enough!" Unable to stand it longer, I walked over to them and said to Mike, "why don't you let him up, he says he has had enough?" "I know," sputtered Mike betwen blows, "but he's such a domned liar ye niver can tell when he's tellin' the truth."—Reader, Pittsburgh, Pa.

Injured Innocence.

MAT and Pat, two brother Irishmen, had taken a sub-contract to build a railroad fill across about ¼ mile of marsh land. The ground being soft and oozy caused much trouble and extra work on account of settling so much over-night that the work of the day before would entirely disappear and had to be done all over again. Finally the two Irishmen hit on a scheme to overcome this difficulty. By working late at night and very early in the morning (or at such hours when there was little danger of being seen by the engineer or his assistants) they would build a log crib several feet high in the center of the fill and cover it over so skillfully with earth that no one would suspect the trick. This made a fill of very little weight and very little dirt and they progressed swimmingly for several days without further trouble with the fill sinking. Very early one morning the engineer happened along before Mat and his brother had quite finished their crib work preparatory to the day's run. An early visit of this kind was something very unusual and unexpected and both men were very diligently placing logs with no thoughts of impending trouble. The engineer stood on a little hill a short distance away watching the two brothers, until finally being sure of what was going on he called out, "Say, what in hell do you fellows think you are doing?" Pat glanced from under his hat brim, and seeing who the visitor was, replied without an instant hesitation, "We're trying to get out these g—— d—— logs." And about that time they were.—F. H. M., Glasford, Ill.

Hindside Foremost.

A COMBINATION of political "argymint" and a slow car made Pat short of time at the job. In his haste to "report" he slipped on his overalls rear side before. Running up the ladder he slipped and fell to the pavement.

"Are you kilt, Pat?' said Mike running to the fallen man.

"No-o," says Pat, and then, catching sight of the overalls, "but I got a divil of a twist."

Skinner Mulvey says: I desire to avail myself of this opportunity of renewing to your excellencies the assurance of my most distinguished consideration. Smoke up!

Needed: A Trans-African Road for War

By HALBERT P. GILLETTE

Editor, Roads and Streets

OUR government is building a road from the railway terminus at Dawson Creek, Canada, to another railway terminus at Fairbanks, Alaska. The distance, in round numbers, is a thousand miles. Work was begun just three months after the Japanese attacked Pearl Harbor. An unpaved but crudely surfaced road will be finished by next spring probably at a cost of less than a single battleship. The number of men at present engaged in clearing and grading is about 30,000, under the direction of General William M. Hoge. This road has been likened to the Burma Road that the Chinese built several years ago to secure military supplies, but which the Japanese now control.

Our government should build a military road across another foreign country, a road not much more than twice as long as that through Canada into Alaska, and vastly more important as a factor in winning the war. I mean a highway across the middle of Africa from the Gulf of Guinea to the Red Sea. This would save nearly 8000 miles of sea transportation of military supplies to Egypt, or 7000 to Iran (Persia). Such a saving in distance would be far more than offset by the lower cost of transportation by water. But ships are relatively the scarcest thing in this war, yet essential to our victory. Moreover, time is a very important factor, and a highway across central Africa would be a great time saver in getting supplies to our allies.

Built from both ends, and with American machinery, such a road can be finished within a year; and by finished I mean not merely graded but surfaced so well that trucks can travel over it at high speed and without injury to their rubber tires. Three months hence it will be freezing in Canada. Most of the men and equipment could then be transferred from Canada to Africa. In the meantime a larger force could have started work on the African highway. About a year hence trucks carrying much needed war equipment and supplies can be rolling over a third "Burma Road."

Large passenger-carrying planes and large bombers are now flying along this route, after hopping some 2000 miles from Brazil to Africa. Only very large bombers can make so long a hop. Small bombers and fighters are assembled near the western terminus of the proposed trans-African highway. All planes can be flown across Africa to Egypt, Iran, Russia, and eventually to India and China.

It has become increasingly evident that this war is to be won by the side that brings the most planes against the enemy, provided only that the planes be at least equal in quality to those of the enemy. The British dare not open a second front unless it is close enough to Britain to be under the protection of fighter planes based on British soil. If not thus protected its transports would probably be sunk by German bombers almost as fast as they reached their destination. This has been clearly shown by events in the Mediterranean, where neither side can transport many men or much equipment by sea.

The water route from our Atlantic ports to a port at the western terminus of this proposed trans-African road is only a little longer than from New York to Archangel, Russia. Convoys to an African port are far more easily protected against submarines. Therefore all types of planes can be delivered via Africa to Russia in greater numbers than via the northern route.

If victory is to come by air, and largely by the aid of Russia, then I see no escape from the conclusion that a trans-African road should be begun at once. Why has this not been suggested before? Mainly, I think, because it is only within the last few months that many men have come to regard air-power as of first importance in war, and because very few men who have studied the problem even with that in mind have had much knowledge about road building. Lacking that knowledge, building a trans-African road would seem so stupendous a job as to receive no serious consideration.

What is being done in Canada and Alaska by 30,000 men is no revelation to contractors and engineers familiar with American road-building equipment. But that it is a revelation to the general public is shown by the fulsome praise of army officers in charge of the work. See, for example, an article in the August issue of "The Reader's Digest," entitled "Our Battlefront in the Wilderness." The praise should go mainly to the American inventors, engineers and manufacturers who have designed and made the road building machinery for which this country is famous.

The proposed trans-African road would cross French Equatorial Africa, but this should not be allowed to interfere with its construction. Madagascar, the great island off the east coast of Africa, is also French territory, but the British took possession of it several months ago, "for the duration."

As a result of the war, idle road building equipment is abundant and can be speedily assembled for shipment, in any desired quantity. Skilled operators are also available in large numbers, as well as experienced superintendents, contractors and highway engineers. Never has there been a time so favorable for the speedy organization of numerous competent road construction gangs, fully equipped, for a grand scale job of road building. Never was there such an opportunity to crush a powerful enemy so quickly by utilizing engineering science.

The Romans built the first great system of military roads. They constructed the roads largely with slave labor, at a snail-like advance. Americans, with powered machines and relatively few skilled operators, can build more road mileage in a year than the Romans built in centuries. They are proving it in Canada and Alaska. Directed to do the same aim in Africa, they will indeed astonish the world—but not themselves.

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The rugged "Rockmaster" Wagon Drill (type UPW-35 shown here) is typical of Worthington's complete range of hand-held rock drills, tampers and paving breakers. They're built to *use less air*, and stay on the job longer, at costs surprisingly low!

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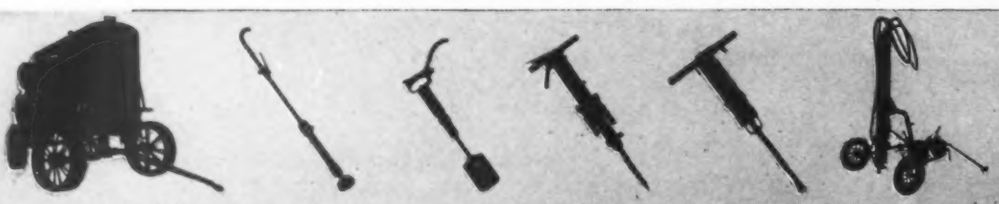

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Canal and Pipe Line Construction to Cost $93,000,000 Authorized

The Mansfield-Pepper bill signed July 23 by the President authorizing canal and pipe line construction, estimated to cost $93,000,000, for expediating the delivery of petroleum products to the East Coast, The work authorized is as follows:

Construction of a high-level lock barge canal from the St. Johns River across Florida to the Gulf of Mexico, following Route 13B as selected by the Corps of Engineers for the original and ill-fated Florida Ship Canal. It will be 92 miles in length, 125 ft. in base width, and 12 ft. in depth, and will include five locks. Estimated cost $44,000,000.

Enlargement of the present Gulf Intracoastal Waterway from the vicinity of Apalachee Bay to Corpus Christi, Tex., and its extension to the Mexican Border to provide throughout its entire length a channel 12 ft. deep and 125 ft. wide at the base. A new link will be dredged between Mobile and New Orleans to avoid the dangerous waters of Lake Pontchartrain. Estimated cost of the entire project is $26,000,000.

Construction of one or more pipe lines, together with all necessary terminal facilities, for the transportation of petroleum and its products from the vicinity of Port St. Joe and other points on the Gulf Coast of Florida to the St. Johns River. Estimated cost of this project is $10,000,000.

Construction of a crude oil pipe line from either Charleston, S. C., or Savannah, Ga., to the Tinsley oil field in the vicinity of Yazoo City, Miss. Estimated cost $13,000,000.

An estimated quantity of 80,000,000 cu. yd. of earth and rock will be moved in building the Florida canal. Large dredges will be started at each end of the canal, with heavy dry-land excavating machinery in the center. The summit cut in the vicinity of Ocala involves the removal of 32,000,000 cu. yd. of dirt and 15,000,000 cu. yd. of rock. Engineers are inclined to use hauling equipment for this heavy task, but this point has not been decided definitely. The five locks will be built of native aggregates with the smallest possible amount of steel. Small dredges and clamshells will be used to enlarge the Gulf waterway.

Construction of the Florida barge canal will be supervised by the U. S. Division Engineer Office at Atlanta, and under the immediate direction of either the existing U. S. District Engineer Office at Jacksonville, or a special engineer office to be established probably at Ocala. Enlargement of the Gulf Intracoastal Waterway will be supervised by the U. S. Engineer Offices at Mobile, New Orleans and Galveston. All contracts probably will be negotiated.

To provide an urgently needed access roadway into a new Lease-Lend depot somewhere in Pennsylvania, this Allis-Chalmers motorgrader rapidly prepared a road section that would serve until a more improved type could be built. Motorgraders and bulldozers are versatile tools without which it is difficult to make progress on most earth moving jobs

Improved Mold Board for Road Graders and Patrols

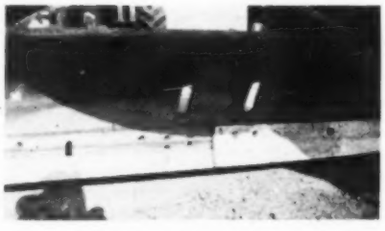
By A. B. CLINKSCALES, JR.
County Engineer, Greenville, Miss.

I WAS very much interested in the article in the June ROADS AND STREETS, "Salvaging Discarded Equipment" by B. W. Davis, State Maintenance Engineer of North Carolina. His "shortage" problems are approximately the same as ours here in Washington County, Mississippi.

I have solved our grader blade problem in a different way and in our particular case I believe it to be more economical.

I have applied for patent on this device but during the present emergency any organization that can use it, is welcome to do so.

Discarded blade and blade after reusing



Any width discarded sections can be matched together

The illustrations show the procedure and results.

Figure 1 is a section view of a standard moldboard and shows the limit to which a grader blade can be worn (shown shaded). This minimum is 3 in. and any wear beyond this point will also wear into the moldboard. However this view does not tell the full story; by looking at Fig. 5, you will see that the blade sections are not worn uniformly, but are tapered from 3 in. at a point in the center of the moldboard to 4½ to 5½ in. at the ends. This is a familiar picture to all persons connected with maintaining county and farm-to-market roads, and is caused by the rounded crown and soft shoulders of such roads. From 40 to 60 per cent of the blade metal is wasted when such blade sections are discarded.

Figure 2 is a section view of the "Improved Moldboard," which consists of a 3½ in. strip welded onto the bottom of a standard moldboard and "drilled and slotted" as shown in Fig. 4.

This blade still has mileage left

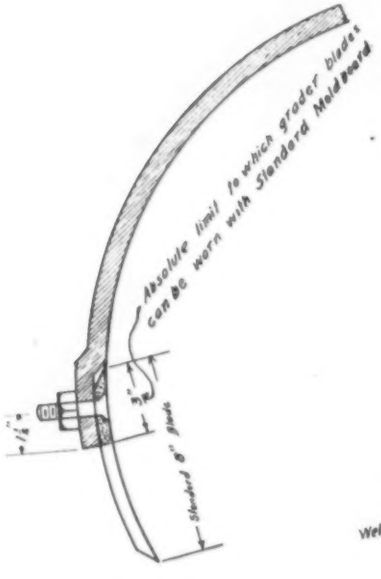


FIG. 1
STANDARD MOLDBOARD

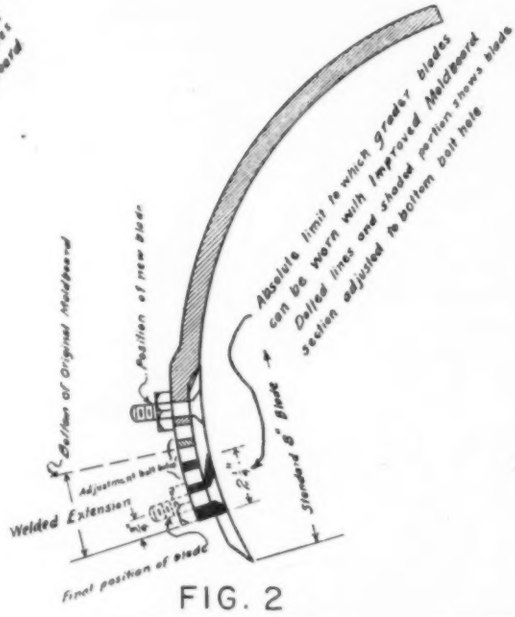

Position of new blade
Bottom of Original Moldboard
Absolute limit to which grader blades can be worn with Improved Moldboard
Dotted lines and shaded portion shows blade section adjusted to bottom bolt hole
Adjustment bolt hole
Welded Extension
Standard 8" Blade
Final position of blade

FIG. 2
IMPROVED MOLDBOARD

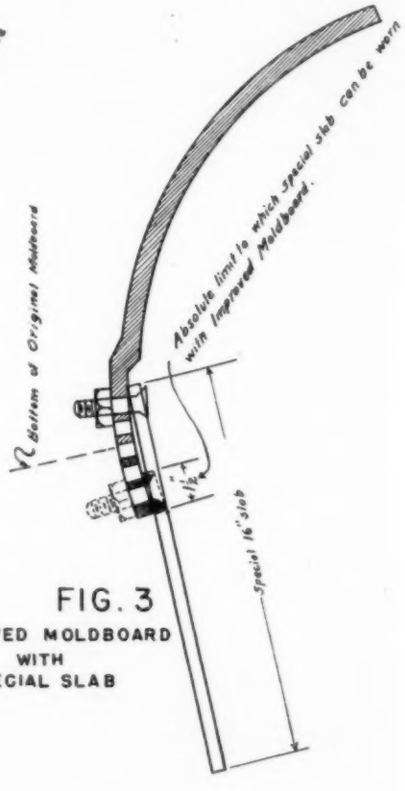
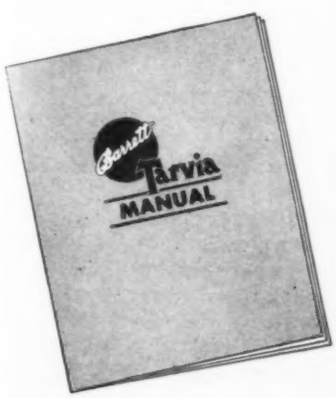


FIG. 3
IMPROVED MOLDBOARD
WITH
SPECIAL SLAB

AMERICA'S ROADS
MUST BE KEPT IN FIGHTING TRIM, TOO!

"Stitch-in-time" road work is especially economical and necessary today. A comprehensive program of maintenance and repair will keep your highways in fighting trim for the duration.



*Reg. U. S. Pat. Off.

America's all-out Victory Program demands 100 per cent performance from every turret lathe and drill press turning out the munitions of war.

It demands equal performance from every link in our vast transportation system. Strategic cross-continent highways and vital feeder roads must be kept in top condition to assure the mobility of a nation that goes to war on wheels.

It's a huge problem of maintenance — and the responsibility rests with every highway engineer and contractor.

Let the Tarvia* field man help you. He can show you how a Tarvia maintenance and repair program can stretch your highway dollar to do *more* of the things required of it. Tarvia is a truly universal paving material—proved by nearly 40 years of service for road-building, maintenance or repair.

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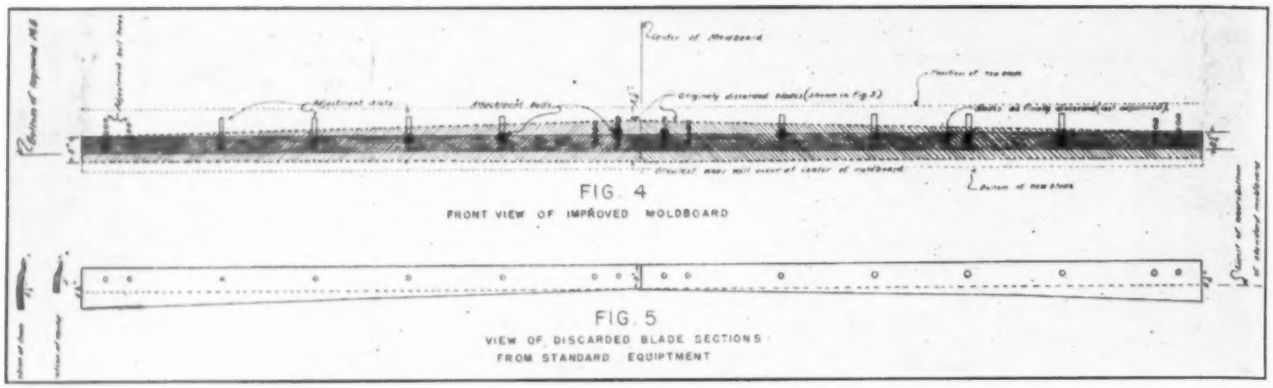


FIG. 4
FRONT VIEW OF IMPROVED MOLDBOARD

FIG. 5
VIEW OF DISCARDED BLADE SECTIONS FROM STANDARD EQUIPTMENT

Now if the discarded blade sections, shown in Fig. 5, are bolted to the revised moldboard as shown in Fig. 4, with the wide ends to the center, and the bottom of these blade sections made approximately straight by engaging the attachment bolts at the center through an adjustment hole near the top, and the bolts at the ends near or at the bottom adjustment holes, and the intermediate bolts engaged through the slots, and all nuts tightened.

This adjustment will leave approximately 1 in. of blade metal below the bottom of the moldboard and is ready for grading operations. As this 1 in. of blade metal wears off, the blade sections can be shifted downward again, using a lower adjustment hole, and grading operations continued, until at the final adjustment the blade sections will be worn down to a minimum of 2¼ in. as shown shaded in Figs. 2 and 4.

Figure 4 shows the amount of additional blade metal utilized for grading operations. The cross-hatched portion shows the originally discarded blades from standard moldboard, and the shaded portion shows the blades as finally discarded, by using the "Improved Moldboard." By actual measurement blade mileage has been increased from 30 to 60 per cent.

Figure 3 is a section view of "Improved Moldboard" and shows suggested use in conjunction with special blades or slabs.

This special blade would be of greater depth than standard blades, and bolt holes would be nearer the top. This combination would make it possible to wear blades to a minimum of 1½ in. If this special blade was 16 in. depth, the per cent of metal used would be $\frac{16 - 1\frac{1}{2}}{16} = 90.6$ per cent, against the per cent used from 8 in. blades $= \frac{8 - 3}{8} = 62.5$ per cent. This size blade could be safely used, because the working lever arm against the bottom of the moldboard would be no greater than that of 8 in. blades on standard moldboard.

The operation of this "Improved Moldboard" is not limited to using new blades, for old discarded blades can be used with no loss of efficiency.

Trans-Isthmian and Chorrera-Rio Hato Highway Completed

Working night and day the Public Roads Administration of the Federal Works Agency has met the Army time schedule for completion of two highways of great importance to defense of the Panama Canal. Early this year Army officials set a date of June 15 for making the Trans-Isthmian Highway available for military use, and July 1 for completion of the Chorrera-Rio Hato Highway, a section of the Inter-American Highway, giving access to important air defenses for the Canal.

The job of placing over 50 miles of concrete surface through the hills and jungles of Panama in six months' time was a big one. Distance from supplies of machinery, repair parts and sources of experienced workmen complicated the problem.

Public Roads engineers organized the work for maximum production of all machinery on the two jobs and by the end of January began to feel that they would reach the goal assigned to them. However, their plans were nearly upset by the weather. The "dry season" in Panama extends from December through April, but this year brought the wettest "dry season" in 20 years.

Torrential rains caused many delays in February, March and April.

Major construction work in Panama generally stops with the beginning of the wet season in May. This year work was pushed ahead in spite of the rains (nearly 3 in. in one two-hour period) and now both roads are surfaced and ready for military use. Some minor work remains to be done in finishing shoulders and putting the final touches on the job.

The Trans-Isthmian project extends from near Colon to Madden Dam, a distance of 24½ miles. From there an existing road connects with Panama City at the Pacific entrance to the Canal. Grading of the new road was largely completed during the dry season of 1941. The surface just completed consists of two 10-ft. lanes designed to carry the heaviest military vehicles at a speed of 60 miles per hour.

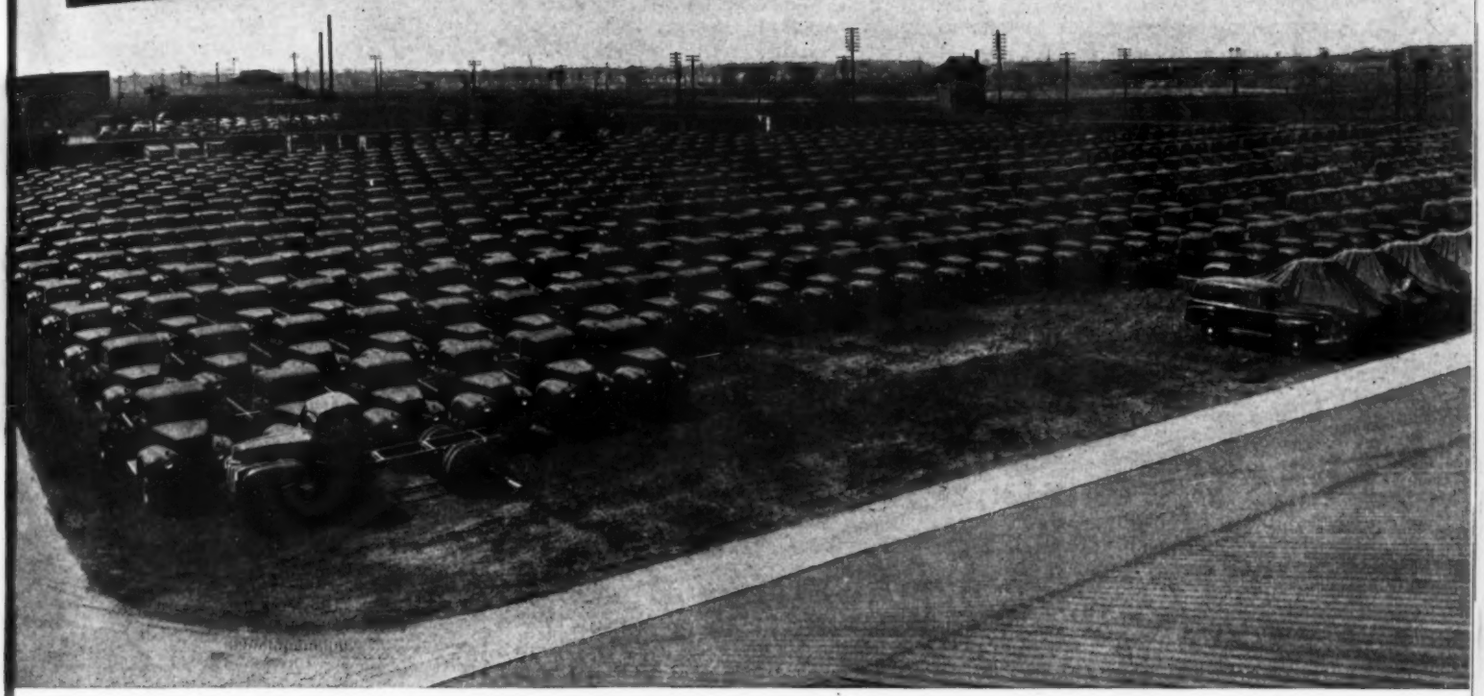
Completion of the road adds greatly to the defense of the Canal. Motorized forces at one end of the canal are almost immediately available for use at the other end.

The Chorrera-Rio Hato road was projected originally as a section of the Inter-American Highway. Chorrera is 25 miles from Panama City to which it is connected by an existing road. The new road extends 52 miles to the important military airfield at Rio Hato. Construction was begun in cooperation with the Republic of Panama under direction of Public Roads engineers. At the outbreak of the war it became imperative that the road be completed in the shortest possible time. About half of the 52 miles had been surfaced. The United States agreed to complete the work without cost to Panama; all available machinery was concentrated on the job, and surfacing was completed on July 1.

The two projects involved 76 miles of concrete pavement, 42 bridges and exceptionally heavy grading.

Work is now under way on a new road to replace the existing road between Madden Dam and Panama City.

THEY WEREN'T "Raised to be Soldiers"



—BUT THEY ARE NOW!

Like the hundreds of thousands of sturdy American boys whose mothers never dreamed they would be called upon to wear khaki and carry guns in a conflict for world freedom, the Marmon-Herrington *All-Wheel-Drive* converted Ford trucks shown here, were originally designed for the services of peace, rather than for war.

Built to carry oil scouts and seismograph crews across country, uphill and down, through desert sands and marsh mud; to build and maintain roads; to battle snow drifts; to haul logs from forests; to set utility poles and string wire over mountain valley and stream—these are the jobs for which they were intended, and which thousands of their "brothers" are doing every day.

But now, with only few changes, and painted olive green, they are pulling field guns, carrying cargo, and hauling soldiers to battle fronts all over the world. Having all four or all six wheels driving, with as many as eight forward speeds, they give breadth of range and mobility unobtainable in any other type of vehicle in military service.

Marmon-Herrington vehicles have "joined up" 100% for service to the United Nations. The ones you have, which are "too old to fight" must keep our vital home defenses ready for any emergency. Keep them fit and pray, with us, that an early Victory will make others available for your service.

MARMON-HERRINGTON

All-Wheel-Drive

MARMON-HERRINGTON CO., Inc., Indianapolis, Indiana

Cable Address: MARTON

Care of Engineering and Surveying Instruments

By LOUIS H. BERGER

President C. L. Berger & Sons, Inc.
Boston, Mass.

THE engineer going to remote places should equip himself with extra wire diaphragms, extra spirit level vials mounted in their casings, extra tangent and leveling screws, and extra clamp screws. He should also equip himself with proper lubricants, an assortment of adjusting pins — large and small, clean linen rags, and long tapered center sticks for cleaning the sockets in which the centers revolve. The cost of these extras is slight when compared with the loss of time, inconvenience or inability to procure them from sources other than the factory.

Care of the Lenses

Much cleaning of the lenses must eventually cause dimness of the image and a loss of definition. It is better to avoid the necessity for frequent cleaning by protecting the lenses as much as possible from exposure to dust and dampness. If the cap is placed over the object glass and the eyepiece cover is kept closed except when the instrument is in actual use the lenses will last much longer.

Care of the Object Glass Slide

The object glass slide should work smoothly but not to freely. It should not be so loose that it will drop when the telescope is turned to a vertical position. The object glass itself should not be greased or oiled, but the rack and pinion motion should be greased with rendered marrow. In cold climates the marrow may harden so as to cause difficulty; in this case vaseline may be used to advantage, but must be renewed frequently in cold weather.

If the focusing slide seems to work too hard, everything else being right, this is generally caused by the hardening of the lubricant on the pinion. In hot weather the same cause may make the focusing slide work too freely by softening, so that the slide will not stay in place when in a vertical position. If the slide moves too freely it should be tightened by running out the slide to its full length and then applying a screwdriver to the screw on top of the focusing screw, and turning very slightly until the required friction is obtained. If the slide works too tightly, run in the slide, unscrew the top screw one turn, gently tap it with the screwdriver handle to release it, and then tighten to the required stiffness.

Care of the Cross-Hairs

If dust is allowed to settle on the cross-hairs, they will present a rough, irregular appearance which is troublesome. To remove this, unscrew both the object glass and the eyepiece and gently blow through the telescope tube. Before putting the lenses back into place cover both ends of the tube with a cloth and wait a few minutes for the moisture to evaporate. The object glass should be screwed up well against its shoulder. As the cross-hair adjustment may have been disturbed by the removal of the object glass, this should be tested after the lenses are put back into place. Do not unscrew the object glass unnecessarily, for this is likely to alter the collimation adjustment.

Care of the Magnetic Compass Needle

The compass needle rests on a finely sharpened pivot, and the accuracy of the results with needle depends more upon keeping the pivot point sharp than any other condition. Therefore, the needle should be let down gently as possible on to its pivot. When not in actual use it should always be raised by means of the lifter. If, when lowering the needle, it is found that it swings violently to reach its north and south position, check this movement with lifter to prevent undue wear on the pivot. When the instrument is being carried the needle should, of course, be lifted against the glass cover.

The preservation of the magnetism is also an important factor in the proper action of the needle. Magnets, or iron or steel objects, should not be brought close to the needle on account of possible permanent injury. When taking readings of the needle, care should be taken that no iron carried on the person is brought near enough to affect the direction of the needle.

In cleaning the glass cover of the compass box a silk handkerchief should not be used on account of the likelihood of its electrifying the glass. After cleaning the glass, breathing upon it tends to draw off the electric charge. If the needle is attracted to the glass when a reading is being taken the cover may be touched with the moistened finger, when the charge will at once be drawn off.

When the instrument is sent from the factory the needle is balanced for our latitude by means of a fine wire. When used in a different latitude the position of the wire may have to be changed. If the needle is but little out of balance it is better not to disturb it. If adjustment is necessary, however, raise the cover glass by first prying up with a knife-blade the circular split ring which holds it (applying the blade where the ends of the ring meet), then lift the glass by means of a piece of softened beeswax. When the construction of the compass box is different from the one just outlined, unscrew the knurled threaded bezel ring which holds the cover glass of the compass. The needle should then be raised by means of the lifter and removed with a pair of tweezers. Move the wire counterpoise in the direction required to balance it, replace it on the lifter, lower the glass and then test the balance by letting the needle down gently on to the pivot. If it becomes necessary to remove the glass entirely, it may be done by unfastening the screw that holds the stud for the telescope tangent screw to the standard.

Care of the Graduations

To remove dust from the graduations and verniers use a fine camel's hair brush. Do not rub the graduation, especially near its edge, as the slightest wear on this edge will make it difficult to read angles accurately. If it becomes necessary to clean the graduations the greatest care must be taken not to scratch the silver sur-

From an address presented before the Northeastern University Civil Engineering Society.

HUGE ASSEMBLAGE OF FIGHTIN' POWER!

Shown here is a part of the big fleet of Allis-Chalmers tractors and Gar Wood scrapers. In all, there are over 200 A-C tractors, 102 Gar Wood scrapers, motor graders, bulldozers, engines and other allied equipment.

OVER 200 ALLIS-CHALMERS TRACTORS ON ONE HUGE SOUTHWEST PROJECT

A vast array of mechanized might is winning another race against time, on another ordnance project — one of the largest, perhaps one of the toughest! Faced with a time limit, long hauls and 5 to 6 feet of muck removal before making cuts and fills . . . officials in charge found they needed equipment with plenty of power for the tough hauling, plenty of speed for the long pulls. Over 200 A-C tractors, together with 102 Gar Wood scrapers and other Allied units were rushed in to take over the brunt of the attack. Put on a three shift, 7 day a week basis, they are building mile after mile of road, handling grading for the railroads, laying the groundwork for the buildings! On every project, of every size, at home and on the fighting front — you'll find these mechanical soldiers of war hurrying the day of peace!

ALLIS-CHALMERS
TRACTOR DIVISION · MILWAUKEE · U. S. A.

BORROW PITS GO STRAIGHT DOWN!

The borrow goes unusually deep on this project to save time and money stripping a wide area of the 5 to 6 foot covering of spongy muck. The tough-loading, sandy-clay borrow is heaped-up in the Gar Wood scrapers with the powerful, 2-Cycle Diesel tractors.

Handling by far the greater part of the bulldozing work are 2-Cycle Diesel tractors equipped with Gar Wood and Baker bulldozers.

face nor to injure the edge. To clean the silver graduations, apply some fine watch oil and let it remain for several hours. Then take a piece of soft (old) linen and rub lightly until dry, but without touching the edge of the graduation. If stains still remain, moisten the finger with vaseline and apply it to the surface; then wipe the finger dry and rub it once or twice around the graduation. This should not be done, however, unless absolutely necessary, because it is likely to destroy the fineness of the graduation. See that the inner edges of the graduations and verniers are free from dirt and grease before replacing the inner center. The vernier should not be unscrewed from the upper plate nor the centering of the outer center altered, as their adjustment is too delicate for anyone but a maker.

The glass covers protecting the verniers, as well as the compass cover glass, need to be carefully brushed and cleaned the same as the lenses, because any scratches or films will impair their transparency. If the reflector shades for the verniers become dirty they should be taken from their frames and washed in soap and water. They should be kept clean so that they will illuminate the verniers and the graduations. The cleaning of the graduations must take place after the lower portion of the instrument has been taken apart for cleaning of the centers, a description of which I shall now give.

Care of the Centers

The two vertical axes about which the circle and the vernier plate turn, or *centers*, as they are called by the maker, form one of the most important parts of the instrument. They should revolve freely but without the slightest looseness. If the centers do not revolve freely they should be cleaned as soon as possible.

To do this, first unscrew the milled-head nut at the end of the cylindrical tube which is opposite the upper tangent screw. This should be done cautiously or the spiral spring opposing the tangent screw may fly out and become lost. Then unscrew a small cylindrical cup which carries the plumb line hook and which is at the bottom of the centers. After unscrewing the nut attached to the inner center a gentle pressure upwards will lift the vernier plate out from the lower part of the instrument. Take a stick having about the same taper as the inner center, wrap some soft linen slightly soaked in benzine or naphtha around it, and clean the inside of the socket carefully. Then remove this piece of linen and wrap a fresh dry piece of linen around the stick. The centers and their flanges should be treated in a similar manner. Before applying the fresh pure watch oil, care should be taken that all dust or other foreign matter is removed from the sockets, the centers, and the graduations. When these surfaces are perfectly clean, fresh oil should be well distributed on all the bearing parts. It would be well to examine also the bearing surfaces of the vernier plate clamp, the lower clamp, and the telescope axis clamp, and clean thoroughly if necessary. After the instrument is thoroughly cleaned and oiled and the nuts and springs replaced, the instrument should turn freely and yield at the slightest touch of the hand.

Great care should be used when removing or replacing the inner centers that nothing injures the edges of the graduated circle or verniers. When the plates are together the vernier and the circle should revolve in the same plane. The space between the two should have the appearance of a uniform fine black line.

Care of the Leveling Screws and Tangent Screws

The screw threads of leveling or tangent screws should be kept clean to avoid sticking. For this purpose use a stiff toothbrush to clean off the dust, then oil the threads and work them in and out. Continue alternately brushing and oiling until they work smoothly. Do not leave oil on the threads, as this would merely collect dust and soon make matters worse.

Care of the Tripod

The tripod legs should not be allowed to become loose. The wing nuts and bolts at the head of the tripod should be well tightened up against the wood. If one of the tripod legs is raised and allowed to fall of its own weight it should sink slowly to the ground. If it drops quickly it is too loose; if it does not fall it is too tight. The shoes should be examined to see if they are loose. The screws in the shoes should be drawn up tightly. The points of the shoes should be sharpened whenever necessary. If these matters are not attended to the instrument may be unsteady. The tripod should be kept well varnished to preserve the wood from the effect of moisture, and should be wiped off if wet.

Care of the Instrument in the Box

The safety of the instrument depends upon the way it is packed in the box. If any of the wooden blocks should become loose they should be repaired at once; the rubber cushions underneath the box, the leather straps, buckles, hinges and locks should be examined frequently and kept in good condition. The box should be varnished whenever necessary. If it becomes wet it should be wiped dry.

Do not place the instrument in the box without having first brought the four leveling screws to bear against the foot plate, and make sure that the telescope clamp and the clamps for the upper and lower plates are tightened. Be sure that no part of the instrument strikes the side of the box or the door when closed.

Storage

The place where the instruments are stored should be kept dry and at a moderate temperature. If there is much dampness it is well to place fused chloride of calcium in an open vessel in the instrument box. If sulphureted hydrogen is present this will blacken the silver. Cotton saturated with lead vinegar will prove an effectual preventive against tarnishing.

Occupations in Which There Is a Shortage of Labor

Paul V. McNutt, chairman of the War Manpower Commission, on July 6 made public a list of 138 occupations essential to war production in which there is a national shortage of labor.

The list was compiled by the United States Employment Service in accordance with a Manpower Commission directive. It is based on the hiring schedules of approximately 11,000 major war industry establishments through August, 1942, in relation to the current reserve of workers.

The most serious labor shortages, Mr. McNutt said, are in the vital metalworking and industrial machinery trades, and in occupations essential to shipbuilding, aircraft, tool and ordnance manufacture. As examples: For every available ship and boat-building assembler, 94 are needed, and for every available tool maker, 31 are needed.

Other occupations in which extreme shortages exist are:

	Ratio of Demand to Supply
Plate hanger (shipbuilding)	62 to 1
Skin man (aircraft)	48 to 1
Crane rigger	22 to 1
Boring-mill operator	16 to 1
Internal-grinder operator	15 to 1
Tool designer	15 to 1
Die maker	14 to 1
Skeleton assembler (aircraft)	14 to 1
Metal chipper (shipbuilding)	11 to 1
Finish boat painter	10 to 1

A BIG HELP TO ARCHITECTS AND ENGINEERS

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TECO Ring Connectors spread the load on a timber joint over practically the entire cross-section of the wood.

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CLEANING CONSTRUCTION EQUIPMENT

By DR. R. W. MITCHELL

Technical Director, Magnus Chemical Company, Garwood, N. J.

A METHOD is suggested here, comparatively new to the cleaning of construction equipment, although it has been in extensive use for many years in the cleaning of automobile and truck motors, chassis, wheels and under bodies.

This method has the advantage of being usable without heat and in addition utilizes low cost solvents instead of expensive cleaning compounds.

It is based on an emulsifiable solvent cleaner sold in the form of a concentrate and mixed in the proportions of 1 part concentrate to 8 parts kerosene or safety solvent to make up the cleaning solution.

In use, this solution is simply sprayed or brushed over all surfaces to be cleaned. A simple sprayer is supplied with the cleaner which with its hand pump, develops sufficient pressure to insure thorough spraying of all surfaces to be cleaned and complete penetration into areas and pockets which are ordinarily hard to reach.

This solution is allowed to soak in from 15 minutes to one-half hour depending upon the extent of the dirt deposits and then it is simply flushed away by cold water under pressure from a hose.

The cleaner solution has the unique property of quickly wetting and penetrating the dirt deposits, however oily and greasy they may be and loosening the bond between them and the metal or other surfaces of the equipment. It works just as well at room or outdoor temperature as when heated and the water rinse is used at tap temperature.

The cleaning job obtained in this way is exceptionally complete, leaving all surfaces treated in a bright film-free condition, ordinarily after one application. In extremely dirty conditions, it may be necessary to repeat the treatment once more. However, it is possible by this method to reach parts of the machine which would not be accessible by other methods and the only precaution necessary is the removal of the rinse water from pockets which because of their nature will not drain freely.

This can be done by mopping, sponging, or absorption with waste or cloth, or by blowing out with compressed air. In fact, it is usually advisable to blow off excess water after flushing, with compressed air or steam jet; or if not available, to use a hot water rinse to insure rapid self-drying of the equipment.

If the equipment is not going to be used immediately it is ordinarily advisable to spray the bare metal surfaces of freshly cleaned equipment after thorough drying with a rust protective oil.

This emulsifiable solvent cleaner is, as noted above, extremely economical to use because a small amount of the concentrate is used with low cost kerosene to make up the cleaning solution.

The resulting solution is non-poisonous, completely harmless to all metals, leather, rubber, and to the human skin. Most important of all, the solution is non-inflammable at any temperature range encountered during its use and hence can be used indoors with complete safety. As a matter of fact, in the fields where this method has been widely used for many years, the cleaning of automobile and truck motors—, it has not been found necessary to disconnect the ignition system during the cleaning, although where ignition systems are involved it is usually the practice to shield that portion of the equipment by the use of a piece of inner tubing.

The point is that there is no fire hazard involved.

Construction machinery of all kinds can be readily and easily cleaned by this method of all ordinarily encountered dirts with the exception of course of cement deposits which have hardened on surfaces. It has the great advantage of being applicable on the job as well as in the central repair or maintenance shop. It is very easy to carry the cleaner, the solvents required and the spraying equipment to any job and set up an easily followed routine cleaning schedule which will insure maintenance of cleaned equipment, whatever its character and on any job, whatever its nature.

Quite a number of contractors who have made it a point to strip and repaint their equipment for proper upkeep as well as for good-will and advertising, have found that the use of this method of cleaning has extended the period between repaintings by surprisingly large margins.

This method of cleaning is also applicable to the cleaning of dismantled parts prior to repair or adjustment in the repair shop. As a rule, the same solution is used in a tank into which the parts to be cleaned are dipped, soaked for 15 minutes, then removed, drained and washed off by water under pressure either in a special booth or in some corner of the shop where the water and splash can be disposed of.

A routine cleaning schedule is the best insurance for any machine, because proper cleaning is certain to add materially to performance life. And it is so easy to insure properly cleaned equipment, free of accumulations of dirt, grease and oil that there is no excuse for the careless and indifferent attention given to contractors' equipment in the past. Such an economical and dependable cleaning routine not only guarantees topnotch operating conditions, but often makes it possible to discover incipient troubles or failures which would have been covered up until actual break-down took place, by the dirty conditions of a machine. Moreover, even in war time the contractor can gain good-will and prestige if his equipment looks well and presents the ship-shape appearance only obtainable by a suitable cleaning schedule.

War Public Works Projects to Be Expedited

The nation-wide facilities of the Work Projects Administration will be utilized to assist in the prosecution of the war public works program, Brigadier General Philip B. Fleming, Federal Works Administrator, announced July 17.

Use of WPA field offices in every State to receive applications for war public works projects will bring the local communities closer to the war effort of the Federal Works Agency, said General Fleming, who, in addi-

(Continued on page 68)

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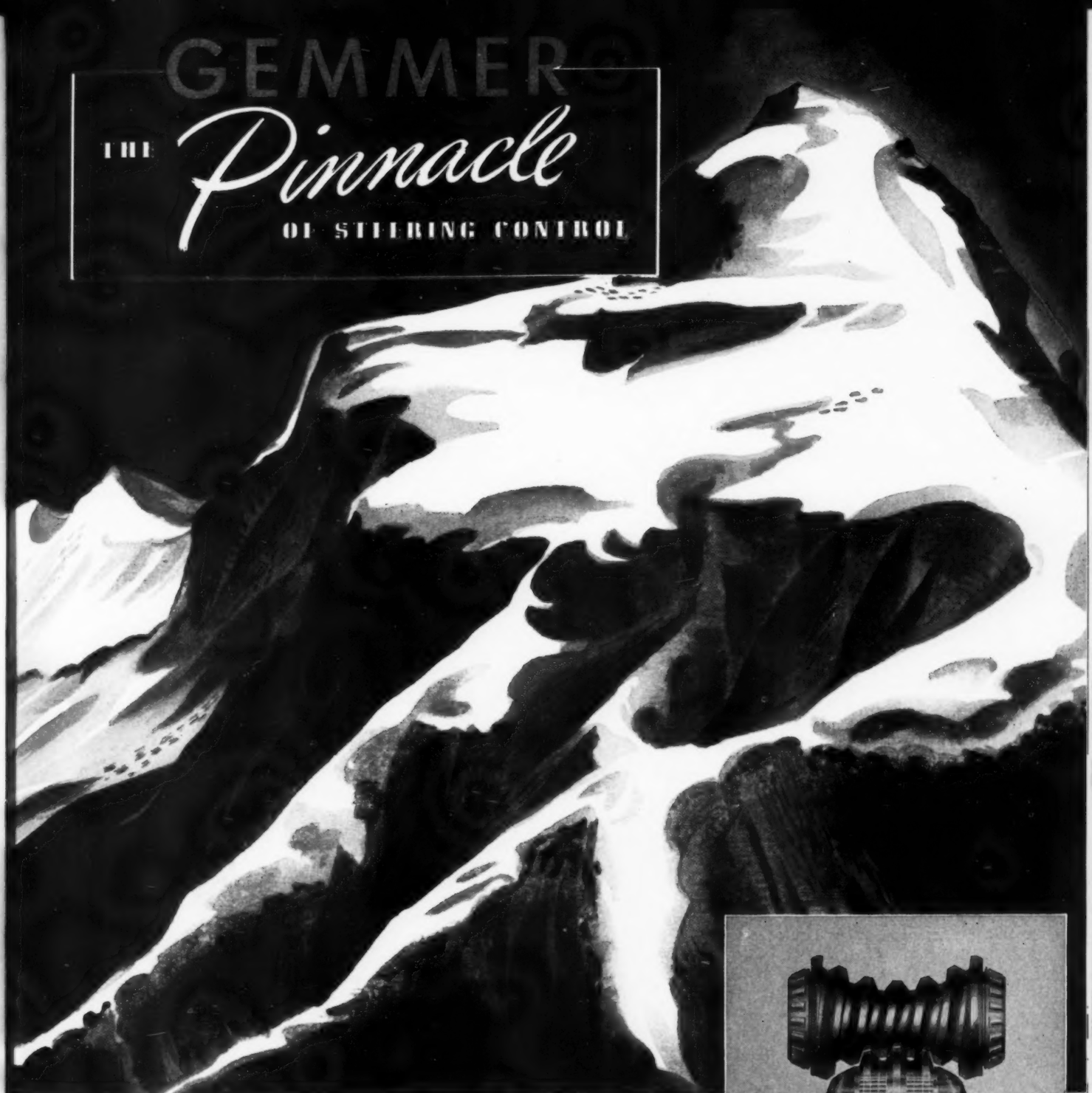
THE *Pinnacle* OF STEERING CONTROL

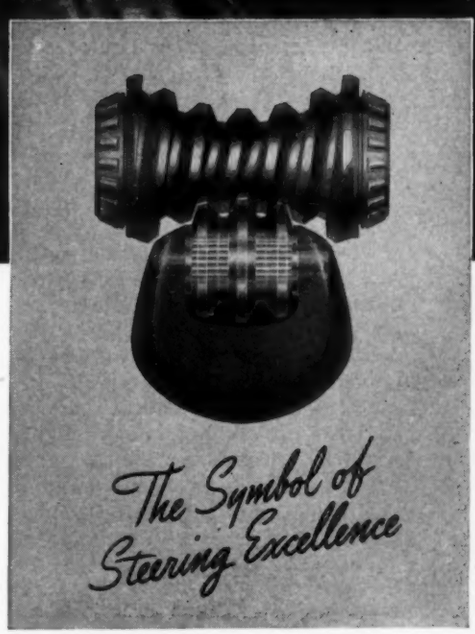


MT. EVEREST

AS THE GIANT peaks tower above the surface of the earth, so Gemmer Triple Roller Tooth Steering Gears tower above other devices in all of the essential factors for desirable steering; indisputably the pinnacle in steering.

"Passenger car ease"—maximum safety in steering—are provided for commercial vehicles of all kinds—including road machinery, trucks, tractors and buses.

Gemmer Triple Roller Tooth Steering Gears embody these all important factors for desirable steering: • *EFFICIENCY*—highest available—provides easy steering always—plenty of power for parking. • *STABILITY*—Steering is firm, response positive, with absence of rubbery feeling and wander. • *SAFETY*—abundant safety factor—low internal stresses. • *DURABILITY*—endurance for the life of the vehicle. • *CONVENIENCE*—compact design for easy installation and weight saving—yet steering arm angularity is ample.



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tion to being FWA Administrator, is also Acting Commissioner of WPA.

"In using the field offices and personnel of WPA we are making it more convenient for local public officials who until now have had to transact business in the first instance with our regional offices which are few and are widely separated," added Gen. Fleming. "Projects will pass from WPA offices to regional boards and should be in good shape for final action when they reach Washington. It is a further extension of our plan to decentralize the work of FWA in the interests of efficiency and economy. WPA may also build some of the projects but its own program will not be affected materially."

At the same time Gen. Fleming announced other changes in war public works machinery and in the central organization of the Federal Works Agency, as follows:

Assignment of Assistant Administrator Baird Snyder to administer all public works projects under the Lanham Act and to supervise the seven Regional Directors with respect to non-federal construction assigned to regional offices.

Abolition of the Regional Engineering Offices of the Office of the Chief Engineer and the transfer of personnel, records and property to the offices of the Regional Directors.

Establishment of Regional Program Review Boards composed of representatives of each constituent unit of FWA to be designated by the Commissioners of each unit, with the FWA Regional Director as chairman.

Creation in Washington of a Program and Project Review Board which will advise the Administrator with respect to all programs and projects of the FWA and its constituent agencies except those as to which specific authority or direction has been otherwise provided by law.

The board is headed by Colonel William N. Carey, Chief Engineer, who now becomes Special Assistant to the Administrator. Other members of the board are the Assistant Administrator, the Commissioner of the Public Roads Administration, the Commissioner of the Public Buildings Administration, the Deputy Commissioner of the Work Projects Administration, the Assistant Commissioner of the Work Projects Administration in charge of Community Services, the Commissioner of the Public Works Administration, the General Counsel and the Executive Officer of the Federal Works Agency.

The order issued by Gen. Fleming July 17 also defined the duties of the FWA Regional Directors.

To Increase Steel Ingot Capacity 9,100,000 Tons

A steel ingot capacity for the United States of 98,279,970 tons by mid-1943 was recommended July 24 by the Iron and Steel Branch, War Production Board.

This is 9,710,000 tons more than the 88,569,970-tons present rated capacity of the industry and represents a 10 per cent reduction from the 10,762,000 tons originally approved following the authorization of the Supply Priorities and Allocations Board on September 30, 1941.

The recommendation was made in a review of the iron and steel expansion program prepared by W. A. Hauck, head of the steel planning unit of the Branch. The review was made by the Branch and by representatives of the Army-Navy Munitions Board following the order of WPB Chairman Donald M. Nelson that all expansion programs be carefully reviewed to save as much critical material as possible.

Completion of the recommended program will present this picture of the nation's steel-making capacity in net tons:

	December 31, 1941	June 30, 1943
Pig Iron	59,406,410	70,351,410
Ingots:		
Electric	3,741,310	5,759,310
Bessemer	6,721,400	6,721,400
Open Hearth	78,107,260	85,799,260
Total Ingots	88,569,970	98,279,970

Not only ingots, but coke and pig iron expansion also have been curtailed in the revised program. Here are the current recommendations as contrasted with the original expansion authorizations, in tons:

	Original expansion	Present program	% of reduction
Coke	9,359,000	7,083,000	24
Pig iron	13,810,550	10,945,000	21
Ingots:			
Open hearth	8,744,000	7,692,000	12
Electric	2,018,000	2,018,000	None

The increase in open hearth steel capacity will be obtained by three steps. New furnaces will provide 4,891,000 tons of the 7,692,000-ton increase; hot metal from blast furnaces, instead of cold scrap, will account for 2,163,000 tons, and restoring and enlarging old furnaces will bring in 638,000 tons.

BOOK REVIEW

The Pan American Highway as Seen by the Motorist

"The Pan American Highway from the Rio Grande to the Canal Zone," By Harry A. Franck and Herbert C. Lanks.

250 pages 8x11 in.—152 photographs.

"The Pan American Highway through South America" By Herbert C. Lanks.

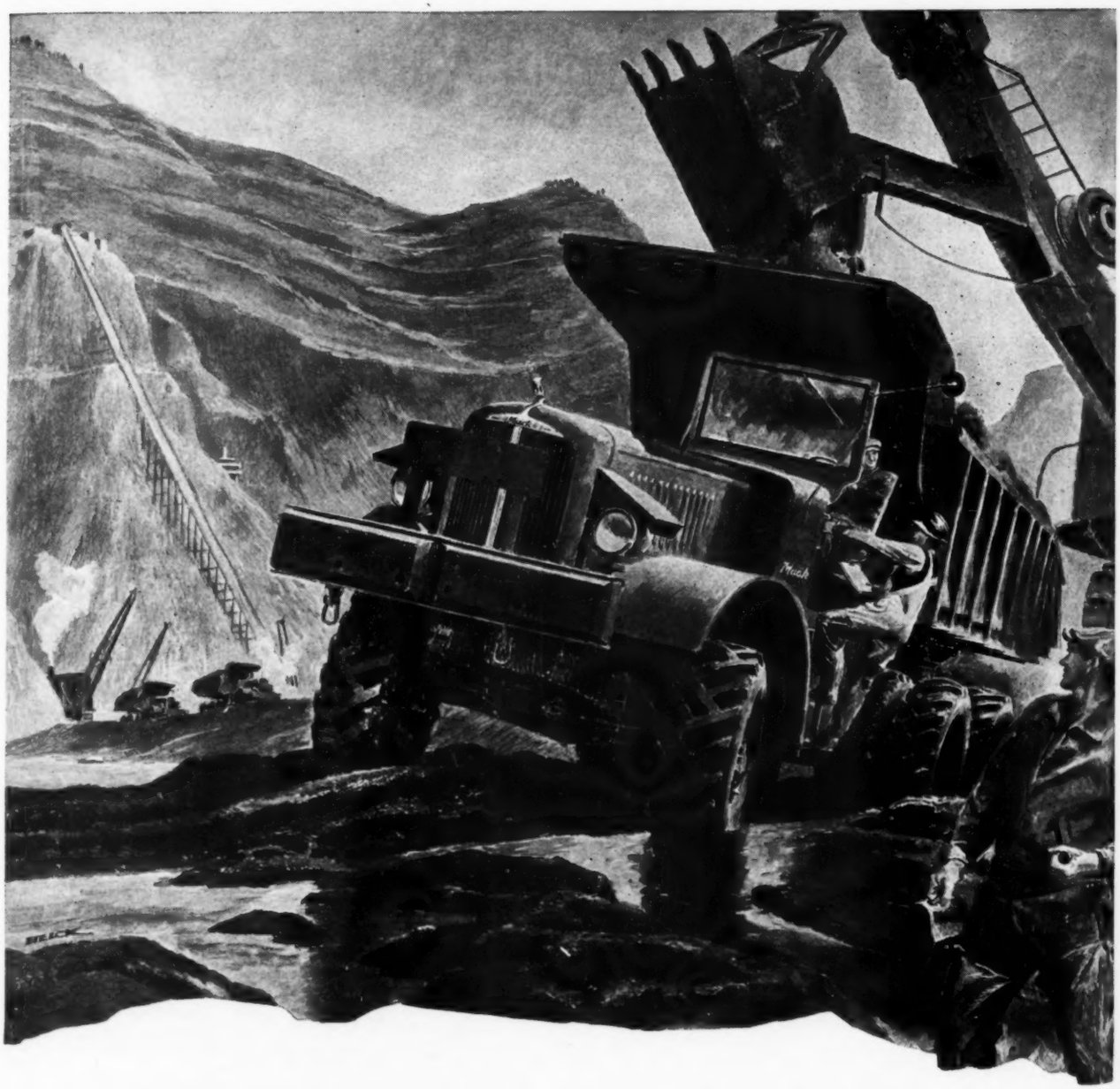
246 pages 8x11 in.—85 photographs.

Articles on the Pan-American Highway—generally on some of its engineering or economic phases—appear in ROADS AND STREETS from time to time. In this issue, Mr. Herbert C. Lanks, well known American traveller, discusses its importance as a major supply route for munitions and essential war materials, and comments briefly on its continental unifying influence, its peacetime economic values and some of the remaining construction problems. But such articles, however pertinent or important, leave untouched the personal and intensely human interest of a trip over these 13,000 (in this case 16,000) miles of highway.

To the American who would look at the peoples, the lands and the cities of countries to the south of us—countries in some respects so different, and in others so like our own—bound to us by an ever-growing community of interest—we commend the two books listed above. For in them the authors have succeeded to an extraordinary degree in carrying the "feel" of the trip to the reader—in giving him a sense that it is he, rather than another, who pushes his way to awe-inspiring heights where the head throbs and the breath comes short, across gleaming deserts and fertile planes and valleys, through picturesque hamlets and teeming cities, to reach at last the very tip of the continent, and then turn northward to end his journey at glorious Rio de Janeiro.

Spanish and Portuguese colonial culture, Indian culture and customs and dispositions in surprising variety, strange food and drink—some good some bad, strange sleeping places—not always comfortable or even decent, perfect roads and roads which try both car and driver, and an all-but-universal courtesy and hospitality, pass in these pages almost as a personal experience.

Many valuable and important facts are given in these books, but they appear as parts of the fascinating running account and have none of the statistical flavor. Each volume is provided with an excellent index.



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IT IS A COMMON SIGHT to see Mack trucks do things that, for most trucks, would be near-miracles. Why does this happen so often? The reason is simple. *A Mack is more truck to begin with.* We do not build Macks just to stay even with somebody else, but to be beyond all doubt or question the *best* trucks in the world. *And an unequalled record stretching back over forty years says that's exactly what Mack trucks are!*

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BUY U. S. WAR BONDS

IF YOU'VE GOT A MACK, YOU'RE LUCKY... IF YOU PLAN TO GET ONE, YOU'RE WISE!

How To Install Payroll War Savings Plan

FOLLOWING a broad program to put the power of an organized promotional campaign behind the Payroll Savings Plan, the United States Treasury Department has made available to nearly every business firm in the country a complete set of promotional material.

All this material is designed to help business firms achieve more quickly the goal of at least 10% of Payroll invested in War Savings Bonds.

Nearly 100,000 of the nation's business firms have already installed, and are operating under, this plan which permits systematic purchases of War Bonds by employees through voluntary allotments from each worker's pay envelope. In most cases the management of the company absorbs the entire cost of administration and bookkeeping—and the plan is so simple in its operation that this expense is normally quite modest.

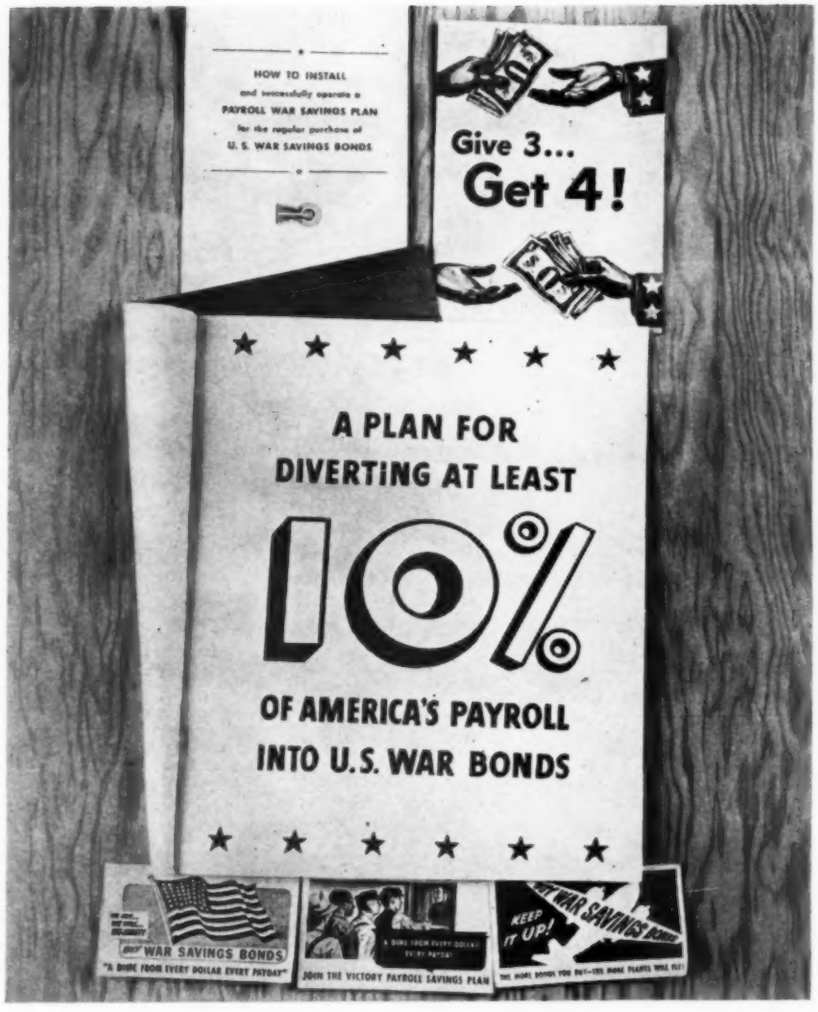
Experience has proved that the Payroll Savings Plan is most effective when stimulated by a well planned, fast-moving program to explain the operations and benefits of the plan and see that it is properly sold to each employee.

Accordingly, the War Savings Staff, with the voluntary assistance of some of the nation's ablest advertising and merchandising men, has prepared and made available complete sets of material that will assist every company in putting on a sustained and successful drive.

The first item in this group of material is a book titled "A Plan for Diverting at Least 10% of America's Payroll into U. S. War Bonds." This book outlines the basis for the overall campaign and explains the general types of material available.

For the benefit of businesses who may not have installed the plan there is another booklet called "How to Install and Successfully Operate a Payroll War Savings Plan for the Regular Purchase of U. S. War Savings Bonds." This booklet explains in simple, clear-cut terms how simple and easy it is for any business organization to make the benefits of Payroll Savings available to its workers.

Basic book for the employee is the one "Give 3. . . . Get 4!" In addition to explaining how money saved by workers is of vital importance in winning the war, it drives home the sound



practical benefits each worker will gain by having a reserve fund saved up for the post-war years. It also answers questions that may be in the worker's mind as to the value of War Bonds as an investment.

Three small envelope stuffers, to be distributed via the pay envelope, are also included. They are designed to keep the subject fresh in every person's mind; to pre-sell workers so that the "Campaign chairmen" will be able to turn in the highest possible percentage of signed authorizations for payroll allotments from the workers they approach.

To give each worker tangible evidence of his participation in this "All America" program, lapel buttons are furnished reading, "I am buying at least 10%." Window stickers with similar copy are provided for the worker's home.

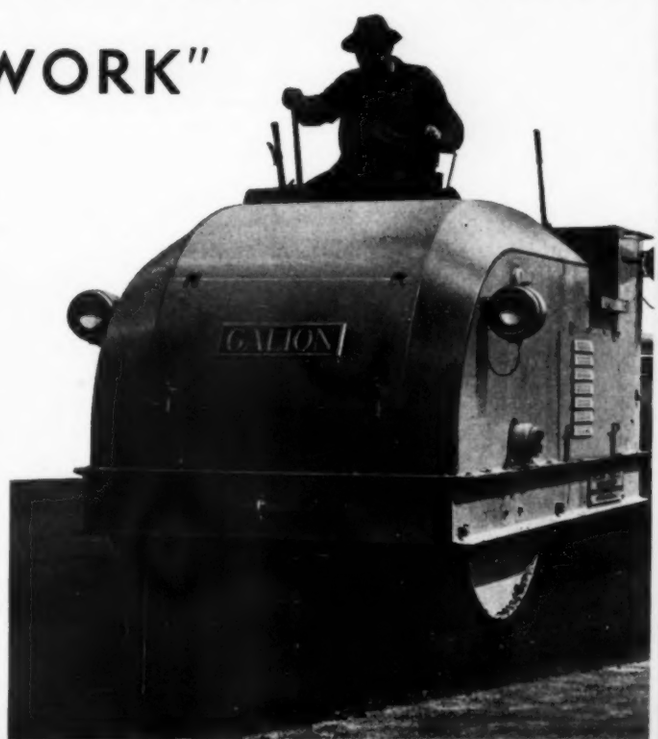
When the entire business has signed up for a minimum 10% payroll, it is authorized to acquire and display the official Treasury Department Target Flag.

This material is distributed through the offices of the War Savings Staff's State Administrators. Any company desiring to get a plan rolling at once is invited to call their local State Administrator's office and request quantities as needed.

Planned promotional programs have proved their value over and over again, in all types and sizes of business organizations. The Treasury Department is harnessing this proved productive method to bring to a speedy conclusion successful Payroll Savings drives in every business throughout the land. Industry, workers and the nation will be benefited as a result.

IF WE ARE TO WIN THIS WAR—WE MUST "GET ON WITH OUR WORK"

Obviously, we have a lot of adjusting to do on account of the war. What with the rationing, high prices, many vacant chairs and the long, strenuous hours being put in on war work . . . our whole standard of living has been changed practically over night. But if each of us "Get on with our work," no matter the task, we have a much better chance to hasten Victory. Galion rollers and graders are doing just that . . . speeding up many war construction jobs.



THE GALION IRON WORKS & MFG. CO.
MAIN OFFICE & WORKS: GALION, OHIO

GALION

Editorial

Is the Hay Burner Coming Back?

CERTAIN classes of truck operators engaged in more or less essential hauling operations, such as conveying U. S. mail to and from the railroad station, have received questionnaires from the government. One of the questions is: "Do you know where you could buy a horse?"

The implication, of course, is that if the truck broke down or the tires wear out, the hauling could be done with horse drawn vehicles.

The Railway Express Agency, which probably operates the greatest fleet of motor trucks in the world, other than those used by armies, has been making a nation-wide canvas to ascertain the availability of horses and wagons for its service.

At the time of World War I the Express Company owned about 15,000 wagons and 20,000 horses. It now has approximately 15,000 trucks.

The results of the canvas were disappointing. They show that manufacturers of wagons were very limited, that manufacturers of harness had turned to other fields and some of the biggest had even lost their specifications. There were only three manufacturers in the entire country capable of making horse collars. Horse shoers were few and far between. In fact it was reported that there was only one in Manhattan Island, New York City.

So it is evident that the horse will never again clutter up the city streets, much to the joy of the street cleaner and to the sorrow of the English sparrow.

Collect Your Scrap Steel and Iron Now

A NATIONAL campaign is now under way for salvaging scrap steel and iron. This material is needed urgently by the steel industry for keeping its mills operating to capacity.

And what "capacity" of steel plants means to the vital war needs of this country is brought out quite clearly by the following figures:

Steel companies having 91 percent of the capacity of the industry reported an operating rate of 98.7 percent of capacity for the week beginning July 20, this being equivalent to the production of 1,676,500 tons of steel ingots and castings. The same companies reported an operating rate of 97.0 percent of capacity for the week beginning July 27, equivalent to a production of 1,647,700 tons. Thus a decrease of only 1.7 percent in the operating rate meant a loss of 29,500 tons of sorely needed steel.

Contractors will play a most important part in this salvage campaign. Equipment yards that we have seen had more useless metal scattered about them than the village blacksmith shop had in the horse and buggy days. One contractor that we know has a string of bottom dump wagons of the vintage of 1910 and a road grader, which if it was not the first one ever made, most certainly was the second. He never uses this outfit, of course; it is just there stuck off at one side of his yard; excellent material for the scrap salvage campaign.

Anything made of iron or steel is valuable as scrap—old shovels, old pipes, old wheelbarrows, old tanks. There may be some old worn out equipment that has been saved for spare parts—these parts could be removed and the remainder scrapped. Get in touch with your local Industrial Salvage Committee if you have any questions regarding procedures.

Scrap metal is needed now and it is needed badly, so get busy.

When Low Wages May Handicap Contractors

MANY contractors have had a big bite taken out of their profits by a sudden increase in the wages of labor. On the other hand it would seem that a sudden decrease in the pay of workmen would be to the advantage of the contractor. But this apparently does not work out that way in the situation that now confronts contractors for government flood control work. This has been brought about by a presidential order freezing the predetermined wage as published in flood-control, river and harbor specifications. For several years these specifications have continued a minimum wage scale, which reflected more or less accurately the prevailing rates of wages in the various communities. Contractors were not allowed to pay less than the minimum scale, but were encouraged to pay as much higher wages as possible.

When the government started its construction program of building army and navy camps and depots, airfields, etc., wage scales on these projects were much higher than wages paid on flood control jobs. As a result levee contractors raised the wages of their workmen to meet the nearby competition. Now levee contractors have been notified to revert to the predetermined wage scales as published in the specifications, and warned not to pay higher rates.

As a result it is anticipated that levee contractors will lose quickly their skilled operators. Dragline operators, bulldozer operators and other skilled craftsmen hardly will remain on a levee job at reduced wages when they can go a few miles to a military project and secure higher wages.

Kaiser: Master Contractor, Master Shipbuilder

THERE is an old saying: "He who has, gets." We think this applies very aptly to Henry J. Kaiser, the West Coast contractor. He has the "goods" and thus has made a remarkable success in everything that he has undertaken.

In peace times Kaiser carried out great construction projects. He was a member of the Six Companies which built the Boulder Dam; he had a major part in the construction of the Bonneville Dam .

When the National Emergency began he went into the business of building ships for the government. Although he had never built a ship before nor even seen a launching, his shipyards were so well planned and organized and operated so efficiently that he was able to reduce the time for building a ship from 140 days to 46 days.

Kaiser has now submitted a plan to the government for turning his shipyards into a plant for building great cargo carrying planes. He has never built a plane, but then he had never built a ship. His past record is an assurance that he can make a success of the new undertaking.

some wars are won *before they start*

Victory may take time. But its foundations were laid long ago by the kind of thinking that has made American fighters and workers respected the world over. When, 17 years ago, men had developed, tested and perfected Preformed Wire Rope they were only following the American tradition of trying to do the job better. Preformed did not seem an urgent necessity, judged by the standards of 1924. But today, under war pressure, Government and Industry are demanding all the Preformed they can get—and more and more of it. Because, now, most men in the heavy industries realize that Preformed Wire Rope wears longer, speeds work, reduces accidents, cuts costs. And by lasting longer, Preformed saved enough steel in one year, for example, to build a striking force of more than 500 tanks. Preformed Wire Rope was not planned for war. But it started years ago to help win it.

Preformed wire rope
Conserves America's Steel

ASK YOUR OWN WIRE ROPE MANUFACTURER OR SUPPLIER

A SUGGESTION TO DONALD NELSON*

By HALBERT P. GILLETTE

DONALD NELSON, Director of War Production, has made a startling statement, namely, that if all factories were to work 24 hours a day, including Sundays, their output could be doubled. This means that they now average half that number of hours. Such inefficient use of factory equipment is bad enough—terrifically bad in these times of war—but it is by no means all of a very sad story. It is well known to factory managers that the majority of workers seldom get out of a machine all that the machine is capable of delivering. This is notoriously the case where closed-shop conditions exist.

Fred Taylor, "father of the scientific management," was not the first to discover that the only way to induce the average worker to speed up is to pay him in proportion to his performance. In many factories Taylor and his associated engineers doubled the output by applying three simple methods: (1) Piece-rate payment; (2) time study of the elements of each operation, and (3) based thereon, a schedule of operations to guide each worker in attaining maximum output.

No one has ever questioned the effectiveness of Taylor's system, but labor unions were against it from its start—60 years ago—and still are against it. Their opposition is alleged to be due to the danger that workers will overexert themselves under the stimulus of greater pay for greater output. But it has been shown numberless times that this does not happen where machines do the heavy work and men merely direct the machines' operations. I fear that the real reason why union leaders oppose piece-rate and bonus payment is because it may deprive them of the credit for obtaining higher wages for the men.

Example Given

My own use of bonus payments has been entirely in construction work. It has never failed to increase output at least 25 per cent, and more often the increase has been 100 per cent. I put the average increase at about 50 per cent, using the same tools and machines.

One of the greatest merits of thus enlisting the enthusiastic co-operation of workmen is that among them there is apt to be one or more who will invent some better device or method for increasing output. Inventive ability is much more common than is generally believed, nor does the inventor always need to have had much schooling to enable him to invent important machines and products. If you question this statement, read Samuel Smiles' "Self-Help," or his "Lives of the Engineers," or his "Men of Invention and Industry," three of the most stimulating books that I have read. Each of these books tells of great and original achievements by men of limited schooling. Our own Thomas Edison was such a man, and so was Michael Faraday, the two most important scientific founders of the great electrical light and power industry.

It Never Fails

Many a Utopian scheme of sharing profits with employees had gone on the rocks until the payment of bonuses was invented, but that form of profit sharing has never failed where it was honestly administered and was not opposed by union leaders. Instead of the hope of a share in a doubtful profit (for losses in business are apt to be as common as profits), the bonus system gives the worker a share in the increased output of the machines, and he gets his share in every pay envelope. That is what "steams up" both his energy and his wits, as nothing else does.

The appeal to patriotism at the present time doubtless increases productivity. It did in the last war, but it had no such great stimulating effect as was hoped. Not all workers are sufficiently patriotic, and few of those that are patriotic respond to their emotions as they do to a monetary bonus.

One great defect of Communism is that it throws cold water on individual ability and ambition. Stalin learned this after years of bitter experience, and introduced piece-rate and bonus payments with excellent results. He has even gone so far as to pay huge bonuses to discoverers of placer gold deposits, bonuses that sometimes make the discoverer rich overnight.

The much maligned and grossly underrated "profit motive" is the most powerful tractor for pulling men out of the mire of indolence. This is true whether it makes of Ford one of the world's greatest employers or whether it makes of a highly paid employee a man eager to be more highly paid.

In a Nutshell

The other day in talking with a well-paid airplane factory worker, I asked whether he could increase his output without injury to his health.

"Of course," he replied, "anyone can."

"Then," I said, "if you were paid a bonus for increased output you would be glad to earn it."

"Sure, but the union won't allow it."

You have it all there, Donald Nelson, and you can hear it again and again from the lips of as many workers as you care to interview. You are calling for more working hours, but that means more working men, and there is a limited number of skilled men. There is, however, no known limit to their productivity, provided that labor-union restrictions are removed. By this, of course, I do not mean that men and machines can be pushed without limit; but I do mean that the feasible limit is usually not known either by the workers or by the managers.

I have seen rock drillers double their previous performance upon receiving a bonus amounting to one-third of the standard daily wage. The drillers were as surprised as I was at the doubling of the footage drilled.

Rewards Urged

One of them came to me and said, "I know how to stop flitchering (i.e., sticking) of the bits. When the bit starts to flitcher, crank it out and

*Reprinted from Los Angeles Times of July 16, 1942.

drop a handful of quartz pebbles in the hole. That does the trick." That trick added another 10 per cent to the footage of every rock drilling machine.

One of the reasons why more such "tricks" are not invented, or when invented are not disclosed, is because managers and owners seldom reward the inventor adequately. If not an "economic crime" it is certainly "malfeasance in office" not to reward an inventor of a useful method or device on a scale that bears some fair relation to the value of his invention. Too often a picayune prize of a few dollars is given for a suggestion that is worth many thousands of dollars. Never was there a more effective way of wringing the neck of the goose that lays the golden egg.

Cement Production to Be Increased

In order to increase the production of portland cement by an estimated 20 per cent, the War Production Board has ordered a reduction to three in the number of types of cement produced.

This restriction is embodied in Limitation Order L-179 which becomes effective 20 days from Aug. 3. The order also prohibits the ear-marking of any bins for particular customers, thus making storage capacity available to all purchasers, and requires portland cement to be tested according to certain specifications.

Requirements of the military construction program have greatly increased the normal demand for portland cement. The restrictions on the number of types which can be produced are expected to bring the total output into virtual balance with overall requirements.

The order, in addition, is expected to save 20 per cent of the power and a considerable tonnage of alloy steels normally consumed by the industry.

Exempted from the restrictions of the order are 11 projects being supervised by the United States Bureau of Reclamation, the Tennessee Valley Authority, and the War Department. The provisions also do not apply to cement commonly known as "oil well cement."

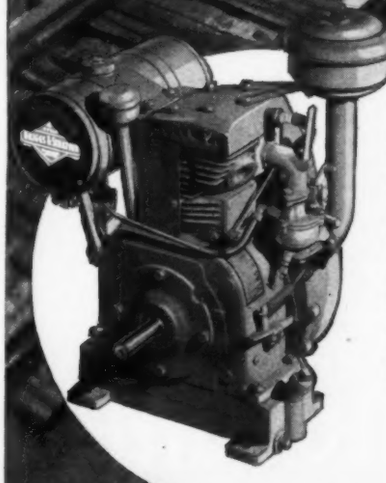
Chile Buys Two Cement Plants

The government of Chile has purchased two United States cement plants which will probably be operated by contractors, to relieve the shortage of cement in that country. Cement has been imported continuously the past year from Canada and Argentina.

SMALL MOTORS ON PATROL —

Guarding America's Railways

Shipments of war material must have the "green light." Roadbeds need inspection and maintenance — bridges, railheads, and war shipments must be protected against saboteurs, wear and tear. So old-fashioned handcars and maintenance equipment give way to modern railroad machinery, much of which is powered by Briggs & Stratton 4-cycle, air-cooled gasoline motors. These sturdy, easy-starting motors can always be depended on to do their part in protecting and maintaining vital rail lines!



Users are urged to check their motors at regular intervals to insure top performance and longer life. If parts or service are needed, go to your dealer or an Authorized Briggs & Stratton Service Station.

Briggs & Stratton motors, from ⅔ to 6 h.p., are "drafted" for the duration — and are available only to those whose equipment is serving the war program — or for "essential" civilian uses. If your products fall in these classes we will try to serve you.

BRIGGS & STRATTON CORP., Milwaukee, Wis., U.S.A.

4 CYCLE BRIGGS & STRATTON GASOLINE MOTORS

How Mississippi State Highway Department Conserves Tires

The State highway department of Mississippi, through its seven district engineers who have charge of maintenance, has issued the following instructions:

1. Close and careful periodic checks on inflation of tires.
2. Changing of tires from front to rear at stated mileages.
3. Reduction of maximum loads on tires to 20 per cent below rated capacity.
4. Immediate repair of cuts, bruises, etc.
5. Pooling transportation of employees.
6. Combing all junkpiles for discarded rubber of all kinds to sell as junk.

Measures taken to conserve equipment.

1. Providing proper storage facilities for seasonal equipment, such as bituminous - surfacing equipment and mowers.
2. Preventive maintenance to catch defects before they become serious.
3. Reduction of truck speeds to a maximum of 30 m.p.h.
4. Reduction of loads.
5. Keeping all equipment thoroughly painted.
6. Maximum use of freight instead of long hauls with department equipment.

Contract Let for 13 Concrete Barges

Contract for 13 concrete barges, designed for ocean travel, has been awarded by the United States Maritime Commission to Barrett & Hilp, general contractors, of San Francisco.

Since the first of the several construction basins is to be completed in eight weeks and the first ship-barge is due to take the water in December, the builders have started power shovels preparing a 60-acre site.

Each of the special barges will carry quarters for a crew of six men and bulkheads will divide each hold into 10 compartments. While there will be no propellers, the ship-shape will reduce resistance to a minimum. Special materials will be used in the concrete to reduce weight and at the same time add strength to the craft.

Instead of building the barges on ways and launching them, Barrett & Hilp will employ a unique basin method of construction.

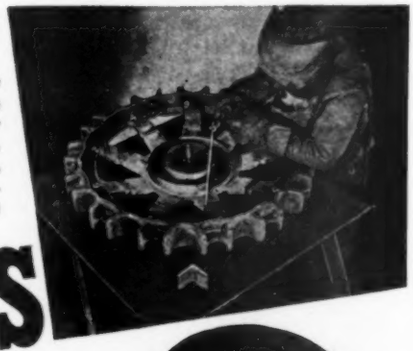
Each basin will be excavated to a depth well below the water of San Francisco Bay and closed off by means of locks or gates. When a barge is completed, gates will be opened, admitting the water which will float the barge out into the Bay.

Reflector Button Posts Installed

In our July issue under Observations by the Way we stated creosoted posts with reflector buttons had been installed on U. S. 30 west of Cheyenne by that city. We have been advised that these creosoted guide posts were installed by the Wyoming State Highway Department. The Department has another stretch of modern streamlined construction on U. S. 30, 108 miles long, between Rawlins and Rock Springs, where these reflector button posts have also been placed. The Wyoming Highway Department was one of the first to place these installations to mark the shoulder lines of the road as a guide during fog or rainy nights or during periods of heavy ground blizzards.

They Last Longer.....Cost Less

You'll save time and money and get a heap more service from your Caterpillar tractor drive sprockets and idlers. . . . Rebuild with renewable, wear-resisting steel rims . . . Easily installed . . . Welding instructions furnished.



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Write for Bulletin No. 115

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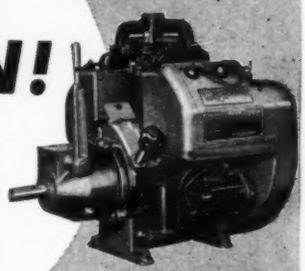
POWER to WIN!

● In terms of man-hours saved, and productive capacity of machines increased . . . Wisconsin heavy-duty air-cooled engines are supplying the United Nations and Industry-at-Large with the Power to Win!



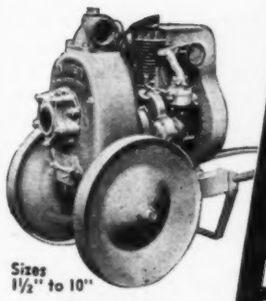
A complete range of sizes, from 1 to 35 hp., 1 and 4-cylinder models. Specified as standard power equipment by more than 300 manufacturers.

MOST POWER Per POUND

WISCONSIN MOTOR Corporation

MILWAUKEE, WISCONSIN, U. S. A.

World's Largest Builders of Heavy-Duty Air-Cooled Engines



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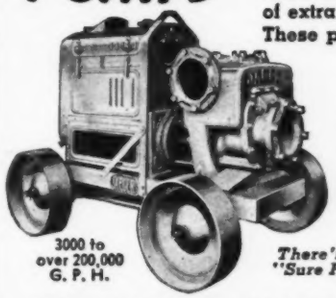


3000 to over 200,000 G. P. H.

There's a size and type of Jaeger "Sure Prime" Pump to fit any job. Ask for Catalog.

THE JAEGER MACHINE COMPANY

223 Dublin Ave., Columbus, Ohio

CONTRACTORS' PUMPS, MIXERS, HOISTS, PAVING EQUIPMENT

Strength Research on ARMCO Emergency Wood Pipe

The results of extensive field and laboratory tests on 20 different sizes and shapes of wood pipes and conduits have been published in a 43-page illustrated report issued in a limited edition by the Armco Drainage Products Association, Middletown, O.

The purpose of the investigation was to determine the structural behavior of a new type of wood pipe and the "pipe-arch" developed by that Association as a substitute for metal pipe during the period of steel conservation. The new pipe, known as Armco Emergency Wood Pipe, consists of a series of inter-connected polygonal shaped rings, each side of which is a pre-fabricated segment, the ends of which are mortised and doweled together so as to form a semi-flexible hinged corner.

Three types of tests were made: laboratory, live load, and dead load. For the laboratory tests, 20 specimens ranging from 24 to 72 in. in diameter were tested in two-point bearing. These tests showed that the Emergency Wood Pipe is a flexible structure with a degree of flexibility comparable to standard corrugated metal pipe. A second conclusion was that failure occurs at the corner joints after the pipe has deflected sufficiently to put the mortised ends of the members in severe bending.

The live load consisted of a truck loaded to give an axle load increasing from 11,420 lb. to 28,160, or 50 per cent more than the legal limits of most states. The fill over the wooden structures varied from .9 ft. to 4.2 ft. Maximum deflection was less than ½ in. under the heaviest load. These tests were particularly convincing to the engineers who witnessed them.

The dead load test was made by piling steel ingots on a 48-in. octagonal shaped pipe under 4 ft. of cover. This test was carried to failure which occurred at 130 tons, or the equivalent of 40 ft. of earth cover. This test showed (1) that the polygonal wood pipe carries dead load similarly to corrugated metal pipe, (2) that the dowels in the joints serve to give the pipe a certain degree of inherent strength but beyond that they have no bearing on the ultimate strength of the pipe, and (3) that regardless of the dowels, the corners remain engaged and transfer stress to the adjacent segments until the mortised projections fail or the angle in the corners approaches 180 degrees.

As a result of these tests and a mathematical analysis of the stresses in the structures under load, a table has been prepared which gives the minimum and maximum cover permissible for various loading conditions on both pipes and arches of various sizes, shapes and wall thicknesses. This table enables engineers to specify the Emergency Wood Pipe with confidence that if the pipe is properly installed it will stand up under the loads for which it was designed. In other words, this pipe is designed on a scientific basis, using a minimum of materials.

Slogans for Speeding War Production Job

The zest with which American workmen have tackled the job of outproducing the Axis is illustrated by the slogans they write to speed the job along.

War Production Drive Headquarters encourages labor-management committees in war plants to conduct slogan contests. Prize winning slogans are usually forwarded to War Production Drive Headquarters. They are selected as the best by committees of

plant workers and not by any government agency. A number of recent prize winners are released today.

Most of the slogans stress the importance of speed, the danger of absenteeism, the perils of inefficiency and the need of working hard, buying bonds and keeping a silent tongue. The following slogans are not necessarily the best; indeed, it would be difficult to select the best of the slogans sent in by 1,000 plants, some of which have sent in more than 1,000 slogans. But these that follow, at least, show the feeling of the American workmen as determined by war plant Labor-Management Production Drive Committees.

"He Who Naps Helps the Japs."—Westinghouse Electric and Mfg. Co., Nuttal Works, Pittsburgh, Pa.

"If We Equip Them, Our Boys Will Whip Them."—Addressograph-Multigraph Corp., Cleveland, Ohio.

"Let's ZINC the hell out of them."—American Steel & Wire Div., Donora Zinc Works, Donora, Pennsylvania.

"Produce! Produce! Produce! And Cook the Axis Goose."—A. M. Byers, Clark Bldg., Pittsburgh, Pa.

"He Who Relaxes Is Helping the Axis." — Guibert Steel Co., 1716 Youghioheny Ave., Pittsburgh, Pennsylvania.

"Save on Scrap and Get Your Jap."—American Steel & Wire Works, 8225 Jones Road, Cleveland, Ohio.

"A Plane Every 8 Minutes in 1942."—Goodyear Tire & Rubber Co., Wilson and Winnings Ave., 1144 E. Market St., Akron, Ohio.

"You Listen, Let Production Talk."—Sandusky Foundry & Machine Co., Sandusky, Ohio.

"Minutes Saved Here Means Lives Saved There." — Arma Corporation, 254 Thirty-Sixth St., Brooklyn, New York.

"America Co-ordinated — The Enemy Eliminated." — Lamson Co., 303 Lamson Street, Syracuse, New York.

"All Out Now—Or All In Later."—American Steel & Wire Co., of N. J., Donora, Pennsylvania.

"You Can't Sit at Ease to Beat The Nipponese."—American Steel & Wire Co. of N. J., Donora, Pennsylvania.

"Your Boner Can Cost a Bomber."—United States Rubber Co., 5675 Anaheim-Telegraph R., Terminal Annex, Los Angeles, Calif.

"Not Defense—But Over the Fence and at 'em."—W. J. Voit Rubber Corp., 1600 E. 25th St., Los Angeles, California.

"Pass the Schedule, not the Buck."—Combustion Engineering Co., Inc., Hedges-Walsh, 1032 West Main Street, Chattanooga, Tennessee.

"Bullets not Bull."—Cramer Posture Chair Co., Kansas City, Missouri.

"Dam the Bottlenecks—Let's Fill the Bomb Racks."—E. I. DuPont De Nemours & Co., Morgantown, West Virginia.

"A grenade in time kills nine."—Everedy Co., Inc., Frederick, Maryland.

"Hit Hitler Here."—Jones & Lamson Machine Co., Clinton St., Springfield, Vermont.

"Come on Boys, 'Let's Go!' With Peak Production, We'll Show, How to Eliminate Tokio."—American Steel & Wire, Worcester, Mass.

"*U*-tmost *S*-peed *A*head."—General Radio Co., Cambridge, Mass.

$5,000,000 Federal Loan for Technical Students

The loan fund of $5,000,000 voted by Congress to help college students speed up their training for technical and professional jobs will be available soon.

Monthly loans totalling not more than $500 a year, at 2½ per cent interest annually and cancelled if the

"WE HAVE USED THIS BUCKET FOR 2½ YEARS AND RECOMMEND IT TO ANYONE WHO DEMANDS STEADY AND MAXIMUM PRODUCTION."

THE CITY EXCAVATING CO.

"We have long since realized," writes A. J. Carlozzi, president of The City Excavating Co., Cleveland, Ohio, "that your 1/2 yard Multiple Rope Bucket gives us far better service than any other make previously used, and we have used several other makes of buckets."

Williams Buckets are truly "built to last and move dirt fast". Each type we build has numerous features which have been developed by over 35 years of bucket engineering for contractors, dredging companies and steel mills. Always a leader in welded design, Williams Buckets now feature welded construction at vital points, using rivets only at certain sections where ultimate replacement may be required. Make your next bucket a Williams!

WELDED

ROLLED STEEL CONSTRUCTION for GREATER STRENGTH and SPEED

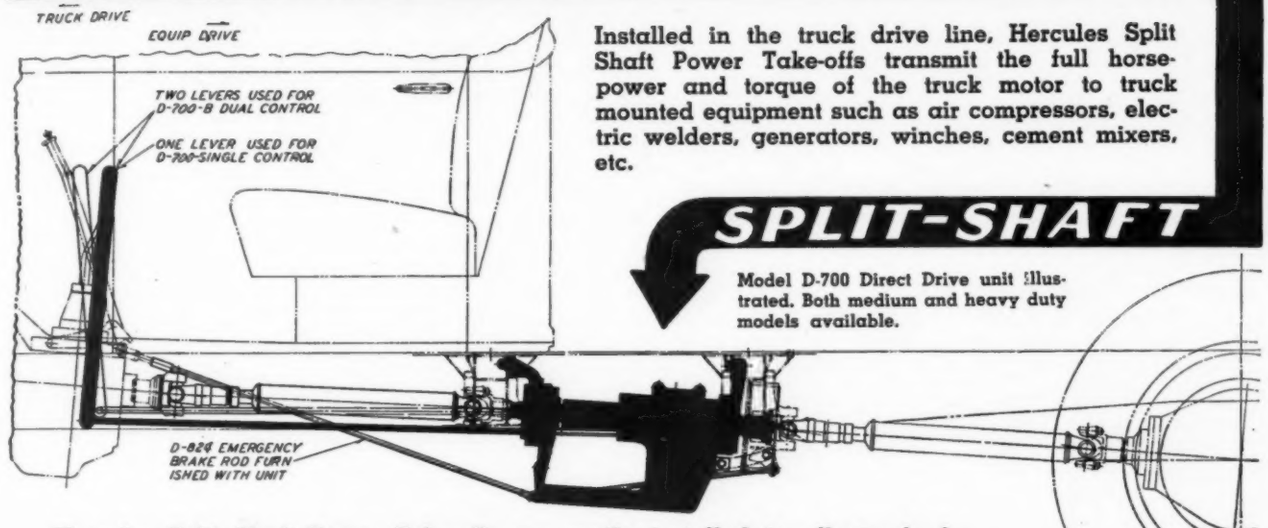
Send for individual bulletins giving full information on each type of Williams Bucket.

THE WELLMAN ENGINEERING CO.
7003 Central Ave. • Cleveland, Ohio

WILLIAMS *Buckets*

built by WELLMAN

HERCULES
POWER TAKE OFF


TRUCK DRIVE
EQUIP DRIVE
TWO LEVERS USED FOR D-700-B DUAL CONTROL
ONE LEVER USED FOR D-700-SINGLE CONTROL
D-824 EMERGENCY BRAKE ROD FURNISHED WITH UNIT

Installed in the truck drive line, Hercules Split Shaft Power Take-offs transmit the full horsepower and torque of the truck motor to truck mounted equipment such as air compressors, electric welders, generators, winches, cement mixers, etc.

SPLIT-SHAFT

Model D-700 Direct Drive unit illustrated. Both medium and heavy duty models available.

Hercules Split Shaft Power Take-offs are easily installed in all standard truck chassis, enabling one truck motor to do the job of two power units.

HERCULES STEEL PRODUCTS CO. GALION, OHIO

student is drafted during training, will be made directly to students by colleges or universities, and by public or college-connected agencies, Mr. McNutt said. Federal funds will be allocated to the loaning institutions by the U. S. Office of Education on the submission of estimates of the amount of money for such loans.

Bulletins announcing the program are being sent to all colleges and universities in the United States by the Office of Education.

This financial assistance will permit students to pursue intensive programs of study which will prepare them as soon as possible to meet growing need for technicians. Loans will be made to students in engineering, physics, chemistry, medicine, dentistry, pharmacy and veterinary who are within two years of completing their work. The program is an outgrowth of recommendations by the Office of Education Wartime Commission which conducted studies of the need of accelerated programs in colleges.

Plans for administration of the student loan fund are being developed by Dr. Fred J. Kelly, Chief, Division of Higher Education, Office of Education. They will be submitted by John W. Studebaker, U. S. Commissioner of Education, to Mr. McNutt, for approval.

Essential points of the student war loan program as developed by Commissioner Studebaker are:

Where to apply. Loans are made to students directly by colleges or universities or public or college-connected agencies. Federal funds are paid the colleges upon estimates submitted as to the amounts necessary for loan.

Special conditions. Loans are available only to students who are registered in accelerated programs in degree-granting colleges and universities and whose technical or professional education can be completed within two years, in one of the following fields:

Fields of work. Engineering, Physics, Chemistry, Medicine (including veterinary), Dentistry, and Pharmacy.

Written agreement. The student agrees in writing (1) to participate, until otherwise directed by the Chairman of the War Manpower Commission, in accelerated programs of study in any of the authorized fields; and (2) to engage for the duration of the wars in which the United States is now engaged, in such employment or service as may be assigned by officers or agencies designated by the Chairman of the War Manpower Commission.

Scholarship. Students must attain and continue to maintain satisfactory standards of scholarship.

Need. Students must be in need of assistance.

Maximum loan. Loans shall be made in amounts not exceeding tuition and fees plus $25 per month, and not exceeding a total of $500 to any one student during any 12-month period.

Security. Loans are to be evidenced by notes executed by student borrowers payable to the Treasurer of the United States.

Interest rate. The rate of interest is 2½ per centum per annum.

Repayments. Repayments of loans are to be made through the colleges, universities, or other agencies negotiating the loans, to be covered into the Treasury as miscellaneous receipts.

Cancellation. The indebtedness of a student shall be cancelled: (1) If before completing his course he is ordered into military service during the present wars under the Selective Training and Service Act of 1940, as amended; or (2) if he suffers total and permanent disability; or (3) in case of death.

About Contractors and Their Jobs

Kansas City Area

REPORTED BY

PAUL L. MATCHETTE

All bids received at the Jefferson City, Missouri State Highway letting, June 26, were rejected by the Missouri State Highway Commission in their July meeting. On several of the projects, there was only one bidder, while on the Newton County and Pulaski County project, no bids were received.

Due to the priority situation and to the increased cost of construction, the State Highway departments throughout this district, are having considerable difficulty in the handling of new construction. It is estimated at the present time that motor car travel throughout this section has decreased approximately 25% over the same period one year ago. Then too, many of the state highway department engineers have resigned and entered the armed forces.

The main problem that the highway departments are now up against, however, is to keep the roads maintained and in condition for emergencies. So far, the highway departments throughout this area are doing a fine job and are to be commended for being able to overcome the many obstacles.

L. W. Hayes, of Bethany, Missouri, and Lloyd Kissick, of the Kissick Construction Company, Kansas City, Missouri, are building the roads and streets at a new Army glider base in western Missouri. Les Hayes owns and operates a large quarry at Bethany, Missouri, not far from the Iowa State line. Les has been furnishing rock to the Missouri State Highway Department for years. Lloyd Kissick is one of the veteran asphalt and oiling contractors throughout this area, having done a large mileage of stabilization and bituminous mat and penetration work, not only in Missouri, but in Kansas and Nebraska.

Frank Trager, of Braymer, Missouri, has just recently finished the production of a large rock job on a Navy Airport near Kansas City. Frank is now finishing up his Lawrence County, Missouri State Highway job. Besides being one of the larger crushed stone producers in the State, Frank has an exceptionally fine grading outfit.

N. R. Sack, Engineer in charge of bridges, Missouri State Highway Department, is on a temporary leave and is in charge of a large project on Government work, in Canada.

The City of Kansas City, Missouri, recently announced that the turnover in city employees for the fiscal year from May 1, 1941 to April 30, 1942, amounted to 77% and that the turnover for May was 12%, while the turnover for June was a new high of 18%.

During May and June, the Personnel Department reports that 568 employees had left the City's service and that 846 were added during this period. Many of these employees are from the Public Works and Park Department. On June 30, 1942, the report made by the Personnel Director showed 3,511 employees on the city payroll. It is stated that approximately 100 city employees at the present time are on military leaves of absence.

GRUENDLER'S FIFTY-SEVENTH YEAR

For Access Road and Air Base Construction

PORTABLE CRUSHERS

Proper Size Aggregates--on the Job

Balanced, Non-Tipping. Expertly designed to meet your exact requirements in proper size aggregates—larger capacity and quick mobility to and from job.

Four Wheel Maintenance JAW CRUSHER with Power Unit

GRUENDLER

CRUSHERS • PULVERIZERS • GRINDERS

GRUENDLER CRUSHER & PULVERIZER CO.
2915-21 N. Market St., St. Louis, Mo.

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DIRT MOVING EQUIPMENT

Highway construction involves more dirt moving than any other branch of engineering construction. ROADS AND STREETS, the only national engineering construction magazine devoted exclusively to, and covering all sections of, the highway field is the most effective and economical medium through which to sell dirt excavating, grading and hauling equipment.

Concrete
VIBRATORS and GRINDERS
Write for Circular on types, sizes and Prices
ELKHART White Mfg. Co. INDIANA

"SPRAY MASTER" PRESSURE DISTRIBUTOR

It's the most Modern Pressure Distributor made today. Exclusive Features give speed of operation and assure 100% Efficiency. Be sure your next Distributor is a "Spray Master."

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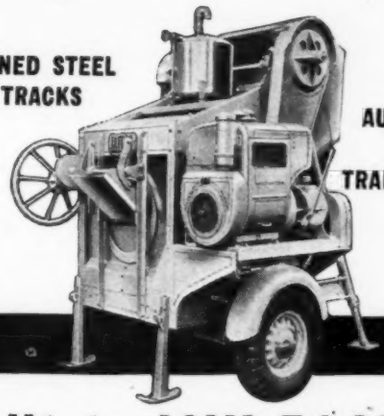
MACHINED STEEL DRUM TRACKS

AUTOMOTIVE TYPE TRANSMISSION



Built to MIX FASTER
RUN SMOOTHER, QUIETER, LONGER

Put a Jaeger on the job and get those profits slower mixers can't produce. Load faster with Automatic Skip Shaker, mix more thoroly with Criss-Cross Action, discharge faster than any other mixer on market. Drums roll on machined tracks, chilled ball bearing rollers. Transmission runs in oil. All sizes trail easily on Timken bearings.

3½S with Measuring Batch Hopper

14S 90" Skip

Send for Catalog. Compare Prices
THE JAEGER MACHINE CO.
223 Dublin Avenue, Columbus, Ohio
World's Biggest Manufacturer of Concrete Mixers. All Types. Sizes to 56S.

JAEGER SPEEDLINE

Harry Henery, well-known hauling and asphalt contractor, of Ottawa, Kansas, recently completed a hauling contract in northwestern Oklahoma, where the average haul was 60 miles. The nearest rock that would meet the specifications could be hauled by truck for less money than it could be transported in any other manner. Jack, as he is called by most of his friends, doesn't bother in regard to time when he is busy and has a job to do. Not only does he operate a large string of dump-trucks, he also has a string of oil pressure distributors and supply tank trucks. When the oiling season is on, especially during July, August and September, Jack doesn't bother about sleeping in a bed. He lives in his automobile, some years averaging between 80,000 and 90,000 miles. He operates his trucks and oiling equipment in Missouri, Nebraska, Kansas, Oklahoma and Texas; an area that covers in the neighborhood of approximately ¼ of the area of the United States.

Keuhne Brothers, of Topeka, Kansas, own and operate the Kansas Sand Company, producers of washed sand and gravel, located on the Kaw River, in the city limits of Topeka. Besides furnishing sand and gravel for highway construction, they furnish dry sand for locomotives and, believe it or not, for baby chicks.

In connection with their sand plant, they also operate a ready-mixed concrete service, operating a string of transit mixers. Otto Keuhne does a real job of keeping all of these activities going at full speed. Most men would be tired out after operating a sand and gravel plant and ready-mixed concrete business. But not so with Otto. So as to really keep busy, he is one of the leading distributors for a well-known brand of beer in northeastern Kansas.

Fred Keuhne operates the Keuhne Wholesale Grocery Company; maintains a factory for the manufacture of a special salad dressing; which truly is delicious, and operates the Keuhne Transfer Company; operating trucks between Topeka and the East, and looks after the Keuhne Storage Company, maintaining a warehouse in North Topeka for this purpose.

Topeka is the capitol of Kansas and has a population of approximately 70,000 people. The Keuhne boys are leading citizens of the city. They started in from scratch and came up the hard way.

R. W. Winters, formerly District Engineer for Oklahoma Portland Cement Association, is now the District Manager for the Portland Cement Association in Kansas City, with offices in the Gloyd Zuilding.

The construction industry in Oklahoma hates to lose R. W. He was well liked throughout the State. a hard worker and a real producer. Although Oklahoma hates to see him leave, they wish him success in his new position. Mark Small, formerly District Manager, is now associated with the Lone Star Cement Corporation.

C. L. "Shorty" Edwards, perhaps the best known and best liked machinery salesman in the state of Oklahoma, has resigned his position with the Clarence L. Boyd Company, of Guthrie, Oklahoma, and Oklahoma City, and is now Superintendent of Equipment for Brown and Bellows, Contractors for the new Naval Amunitions Plant at McAlester, Oklahoma.

For the past 20 years, Shorty has been handling and selling construction machinery. Not only does he know tractors and grading equipment, he is an expert on all types of concrete and oiling equipment. He not only has sold and installed aggregate

producing equipment, but also has owned and operated this type of equipment. All power to you, Shorty!

Michigan Area

REPORTED BY

J. M. TELFORD

W. H. Rarvie, Road Engineer, and Olaf Stokstad, Soils Engineer, have been granted leaves of absence by the Michigan State Highway Department in order to permit them to accept positions with the Army Engineers Corps. Mr. Harvie has received a commission as a major, and Mr. Stokstad has been employed, for the time being, in a civilian capacity.

Low bidders on projects calling for improvement of 30 miles of highways on the strategic network, two grade separations for the Detroit Industrial Expressway, and 2.266 miles of pavement near Battle Creek on an access project were determined recently by the State Highway Department. The successful bidders were as follows:

1.442 miles of grading and concrete pavement in Calhoun county, L. W. Edison, Grand Rapids, $70,205.65.

10.74 miles of bituminous resurfacing in Cass and St. Joseph counties, Michigan Asphalt Paving Co., Royal Oak, $170,092.

0.824 mile of grading and concrete pavement in Kalamazoo county, P. VanderVeen & Sons, Grand Rapids, $92,508.89.

10.036 miles of bituminous resurfacing in Kent county, General Paving Construction Co., Grand Rapids, $182,366.55.

8.94 miles of bituminous resurfacing in Lenawee county. The Cooke Contracting Co., Detroit, $135,932.80.

Bridge of three spans in Washtenaw county, E. C. Nolan & Son, Detroit, $12,248.10.

Grade separation of eight spans on Detroit Industrial Expressway in Wayne county, L. A. Davidson, Lansing, $253,133.

Grade separation of six spans on Detroit Industrial Expressway in Wayne county, L. A. Davidson, Lansing, $205,274.95.

Many of Michigan's asphalt paving contractors have constructed asphalt storage facilities to assure them of a steady source of material during construction projects and to eliminate the problems that otherwise would result from current regulations regarding prompt return of tank cars. The storage tanks are built of a variety of materials — cement blocks, poured concrete, old gasoline or oil storage tanks, lumber, etc.

A sinkhole 300 feet long, 60 feet wide and up to 18½ feet deep developed overnight on a county road in Lenawee county.

Although showing a marked decrease over record-breaking figures established last year, traffic on many Michigan highways and across the Straits of Mackinac is still in excess of 1940, according to recent surveys.

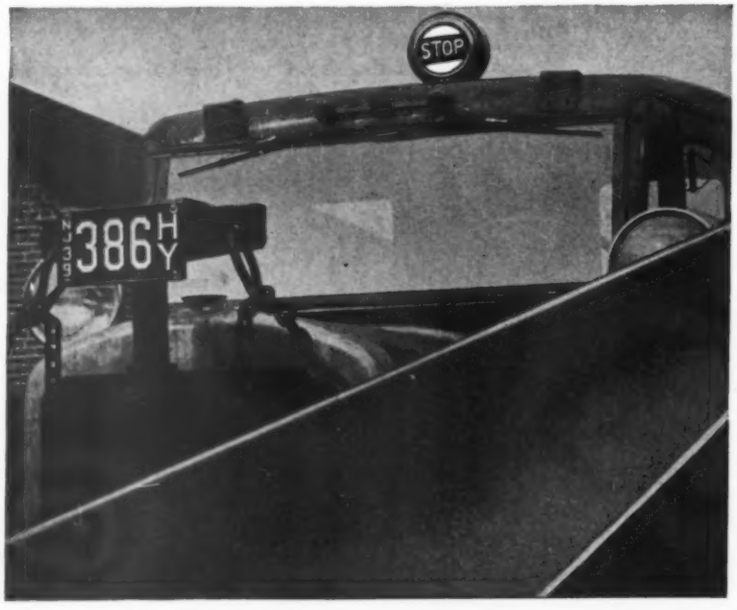
George Metcalf of the Dow Chemical Co. has been elected president of the Michigan Good Roads Federation. Harry Pickitt, head of the Michigan Road Builders Association, is the Federation's new vice-president, A. M. Davis, district manager of the Portland Cement Association, is the treasurer. and Mott B. Heath of the State Highway Department, secretary. Directors are J. M. Telford, Lansing; R. W. Roberts, Dearborn; W. H. Wallace, Bayport; Richard Harfst, Detroit; William Palmer, Lansing; L. C. Sauer, Lansing; Floyd E. Koontz, Lansing; Carl T. Bowen, Grand Haven; Don B. Smith, Detroit, and Herbert A. Olson, Ann Arbor.

IMMEDIATE DELIVERY

KEYSTONE

SNOW PLOW LIGHTS

For Safer Snow-Fighting and Cindering



Successfully used in following States

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OHIO
PENNSYLVANIA

WRITE AT ONCE FOR FULL DETAILS AND QUANTITY PRICES.

AUTO GEAR & PARTS CO.

1410 W. Hunting Park Ave. Philadelphia, Pa.

New Equipment and Materials

Trailer with Hopper-Type Dump Body

Union Collieries Co., Pittsburgh, Penn., is operating a fleet of five Fruehauf trailers with 20-yd. hopper-type dump bodies stated to be capable of

Trailer with hopper-type dump body

transporting 1500 yd. of coal per day. The five trailers transport small lump coal from tipple to dumping site. Each of the trailers makes 15 trips in a 16 hour day. The trailers are stated to dump their load while in transit in a period of only one minute. The trailers are pulled by Brockway tractor.

New Electric Tractor

A new electric tractor, powered by two heavy duty tractor units, including two motors, has been brought out by the Crescent Truck Co., Lebanon, Penn. Features of this new development include 4-wheel, extra large external contracting brakes, mounted on worm shaft, providing equal braking on all wheels. Frame is of extra heavy construction from standard plates and shapes, hot riveted and welded into rigid and mono-unit construction. This model, "NTTD," offers

Model NTTD Tractor

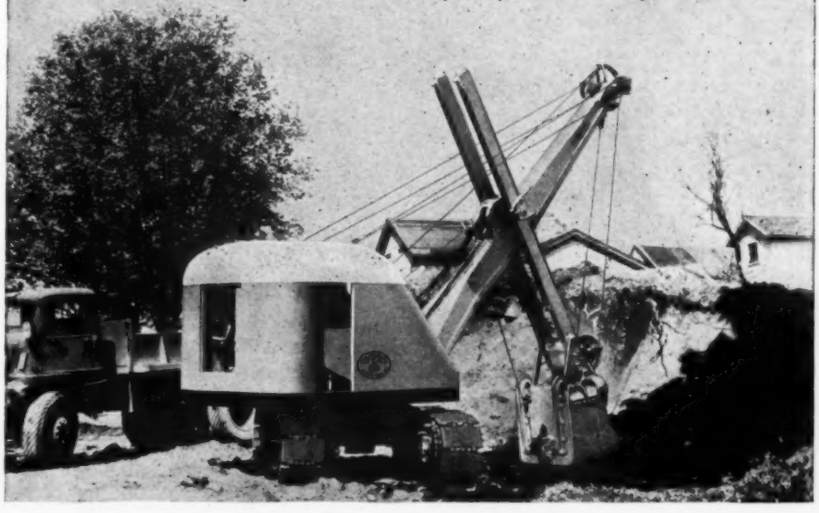
a drawbar pull of 800 lb. normal, 3600 lb. ultimate. Overall length 84 in., wheel base 48 in., overall height 59 in. Travel is controlled by a lever-operated drum-type controller, which is interlocked automatically with the operator's seat and brake foot pedal. If controller is left in any speed position, handle must be brought to neutral, with brake released and operator seated before power can be applied. Battery compartment can be provided for either side or top removal of battery.

Redesigning Carryall Tires Saves Rubber

Denn M. Burgess, vice-president and general manager of R. G. LeTourneau, Inc., is the man responsible for the idea that will save one-half million pounds of rubber at LeTourneau alone in the next year. Working on a request from the U. S. Engineers, Mr. Burgess devised a method of cutting down crude rubber content of the 18 x 24 tires used on LP Carryall scrapers by 25 per cent. Savings in proportion will also be made in the manufacture of 16 x 20, 10 x 20 and 8.25 x 20 tires used on smaller model

SPEED

... to keep truckers "humping."
... to make extra yardage on easy going.
... to get each full dipper up and out by the time it swings over to dumping position.
... to retract twice as fast as it crowds.
... to dump sticky materials with vigorous crowd-retract shake.
... to drop more dollars in your pocket more quickly.



"Speed" is the word on today's construction! Speedy completion of your job requires equipment capable of more than ordinary speed.

You won't have to step up the governor on the motor of any Byers to get all the speed in digging, traveling, swinging that your operator can safely use. Up to 174 f.p.m. line speeds and 5½ R.P.M. swing speeds on various Byers excavators.

This is another reason why you should investigate Byers ⅜ to ¾ yd. shovels and cranes.

Modern CRANES and SHOVELS

BYERS

RAVENNA, OHIO

D. M. Burgess and redesigned tire

Carryalls. Approximately 70 lb. of rubber will be saved on each 18 x 24 tire manufactured—60 lb. from the casing, 7 lb. from the tube and 3 lb. from the flap. This saving in rubber does not affect the load capacity of the tires but will cut the estimated working life from 30,000 to 20,000 hours, which represents 5 years of service for contracting work and 10 years in the Army. The new victory or economy tire will have a tread of ¼ in. This newly designed tire has been accepted by the War Production Board as standard equipment on all types and makes of heavy grading equipment. The tires will be manufactured by Firestone and Goodyear.

New 25-Ton Standard Speed Screw Jack

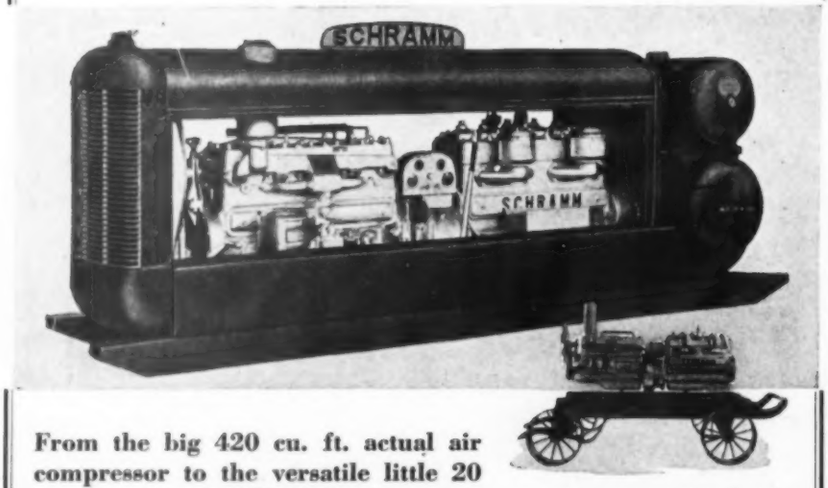
Templeton, Kenly & Co., Chicago, makers of Simplex Jacks, have announced the addition of a 25-ton standard speed, bevel gear, ball bearing screw jack, No. 7300. Toe lift is a minimum of 11 in. from base, but jacks can be made with toe in any position to suit user's requirements, and the base design can be modified. No. 7300 is guaranteed to lift its full rated capacity of 25 tons on cap and 12½ tons on toe; has a full 6 in. lift and weighs only 82 lb. complete.

New 25-ton screw lift jack

New Tubeless Tire

Invention of a heavy-vehicle tubeless tire has been announced by the B. F. Goodrich Co., Akron, O. Use of a specially designed locking member which retains the air in the casing is the secret of the new development. It is stated that substantial test results obtained by the company have demonstrated its usefulness and ability to perform under all sorts of difficult road conditions. Further tests under other auspices are now being conducted. The new device can be mounted in a tire with ease in a procedure which is simple to learn and requires no special tools. In the event the tire is cut or otherwise becomes deflated, valuable time can be saved in repairs as there is no inner tube to be patched or replaced. While the amount of rubber saved by the new invention varies depending upon the size of the tire, it is estimated that at a minimum the saving was approximately 7 per cent of the rubber content of the conventional casing, tube and flap ensemble.

Easy to Start— Hard to "Stop"



The rigid, permanently aligned Schramm compressor and engine are mounted into the frame as one complete unit.

From the big 420 cu. ft. actual air compressor to the versatile little 20 cu. ft., every SCHRAMM compressor is a compact package of power—always ready to start at the touch of a button; yet never ready to quit on the toughest jobs. From the Arctic Circle to the Tropics, users have found that SCHRAMM all-weather compressors incorporate advantages that assure them of a dependable source of air power with a minimum of attention or servicing.

Gasoline—Diesel—Electric

You know which size, type and drive is best suited for your requirements. SCHRAMM knows best how to build it. For back of every compressor bearing our name are 42 years of engineering and research devoted exclusively to this equipment.

Send for Catalog 42-P

SCHRAMM THE COMPRESSOR PEOPLE

SCHRAMM, INC., WEST CHESTER, PA.

With the Manufacturers

Burton L. Boye Dies

Burton L. Boye, president of the Asphalt Institute from 1933 to 1938, and formerly in charge of the asphalt department of the Standard Oil Company of New York, died at Summit, N. J., on July 9th. Mr. Boye served with Socony for 38 years until his retirement, in 1938. At the time of his death he was filling a war emergency post as acting mayor and president of the common council of Summit.

Cummins Engine Company Appoints New Service Manager

Recognizing the importance of Service Department training and experience, the Government has again called upon the Cummins Engine Co. for men with experience in this field. Dave Cravens, Cummins' Service Manager, was the first to volunteer his services. Robert Bloomenstock, also of the service and parts department, was next, being appointed to special diesel work in the Navy. Now, Robert Stratton, former Cleveland Regional Manager who replaced Mr. Cravens as acting Factory Service Manager, has accepted a commission in the U. S. Signal Corps. Upon Mr. Stratton's departure to assume his new Army duties, P. E. Letsinger vice-president in charge of distribution has announced the appointment of Deloss Cummins as Service Manager. Affiliated with the Cummins Company almost since its inception, Mr. Cummins started on the assembly line in 1915, worked his way up to factory superintendent in 1924 and filled this position until his transfer to the Service Department in 1929. Mr. Cummins has worked in the field with dealers, distributors and owners and this fact, in conjunction with his background of factory experience, gives him a full understanding of service problems

Deloss Cummins

Mr. Cummins states that no radical changes in the present service policy are anticipated.

Clifford O. Richards Appointed Purchasing Agent for Taylor-Wharton

George R. Hanks, President of Taylor-Wharton Iron and Steel Co., the country's oldest iron producer which this year is celebrating its 200th anniversary has announced the promotion of Clifford O. Richards as purchasing agent. Mr. Richards, formerly assistant, succeeds R. C. Schaeffer, resigned.

C. O. Richards

Prior to joining Taylor-Wharton in January, 1941, Mr. Richards was with the Fitz Chemical Co., subsidiary of the J. T. Baker Chemical Company. Mr. Richards' office will be at the Taylor-Wharton plant in Easton, Pa.

Four New Distributors for Kotal

The Andresen Corporation of Skokie, Ill., mid-continent agents for Kotal, has announced the addition of four new distributors for Kotal: Badger Surfacing Co., Oshkosh, Wis.; Truman L. Platt, Springfield, Ill.; Rock Hill Asphalt & Construction Co., St. Louis, Mo.; Merrill Engineering Co., Jackson, Miss.

Herrington Elected Director Society of American Military Engineers

A. W. Herrington, President of the Society of Automotive Engineers, technical advisor to Col. Louis A. Johnson on the recent American Economic Mission to India, and president of The Marmon-Herrington Co., of Indianapolis, Ind., has been elected to serve for three years as a director of the American Society of Military Engineers. Mr. Herrington is widely known throughout the world as an expert on military transport, and is the designer of many vehicles now in the service of the United Nations on all the major battle fronts of Europe and Asia. His company at Indianapolis was one of the first automotive com-

Replace DANGER with SAFETY

Place DIETZ LANTERNS on guard for every emergency use. They faithfully guide the way, night after night, without diminishment of light.

DIETZ LANTERNS will not fail or falter as long as a drop of oil remains to burn. Many models will give light and safety for an entire weekend with plenty of kerosene left to spare.

Keep your DIETZ LANTERNS in good order — ready for service the moment needed.

Do not gamble with light and safety. Buy DIETZ LANTERNS—dependable for over a century.

ALSO DIETZ ROAD TORCHES

1840 R. E. DIETZ COMPANY NEW YORK 1942

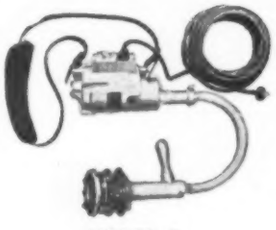
Output distributed through wholesalers exclusively.

SAUERMAN

POWER
SCRAPER
Because of its streamline design, a Sauerman Crescent scraper penetrates hard materials with the ease of a plowshare, and both in digging and hauling it requires much less line pull than any other scraper of equal capacity. It digs a heaping load in a few seconds, moves this load rapidly over the ground, dumps cleanly when it reaches the dumping point, and then returns at high speed to dig another load.
Write today for catalog and see for yourself how others are making big profits by using Sauerman scrapers for excavating, stockpiling and general material-handling work.

SAUERMAN BROS., INC.
588 S. Clinton St. Chicago

"BERG"
Concrete Surfacers



MODEL A

Concrete Surfacers, Concrete Vibrators and Hi-Way Surfacers —for concrete construction.

Cleaning, grinding, wire brushing, sanding and polishing equipment —for use on wood and metal surfaces.

Available in electric motor and gasoline engine driven models.

Write Dept. C

THE CONCRETE SURFACING MACHINERY CO.
CINCINNATI, OHIO

panies in the United States to achieve full-scale conversion to war production, and Marmon-Herrington vehicles were among the first of American manufacture to go into action in both the Near and Far East. As a captain in the military transport service of the A. E. F. during the first world war, and later during many business trips to the old world, Mr. Herrington had opportunity to study the terrain and transportation problems of most of the countries now in the war. His observations and knowledge of automotive engineering suggested numerous improvements in design of all the All-Wheel-Drive trucks, track-laying tractors and tanks, which have been adopted almost without exception by the United Nations. In peace time Marmon-Herrington All-Wheel-Drive converted Ford trucks and Heavy Duty All-Wheel-Drive vehicles have helped develop most of the major oil fields of the world, and have been exceedingly valuable in the most difficult construction and maintenance jobs at home and abroad. The entire output of the greatly enlarged Marmon-Herrington plant is now given over, however, to the building of vehicles of war.

S. P. Deas Made Assistant Secretary-Manager Southern Pine Association

Stanley P. Deas has been appointed assistant secretary-manager of the Southern Pine Association. Mr. Deas succeeds Peter C. Gaffney, Jr., who has entered the army. Mr. Deas is 38. He has been with the Southern Pine Association organization for the last 18 years. He has served the organization in various internal capacities and in recent years has been active in trade promotion and public relations.

Employees Wood Refinery Make Safety Record

A new world's safety record for the petroleum industry has been set by the more than 1,000 employes of the Wood River, Ill., refinery of Standard Oil Company of Indiana who are producing fuels and lubricants for the armed forces, war industries and the farm front, according to an announcement today by S. A. Montgomery, manager at Wood River. The record is 6,850,000 man hours of work without loss of time or disabling injury because of accident. For nearly four years the Wood River refinery workers have carried on their work day and night without a single disabling accident. Their record ended when a pumper helper stumbled and fell while descending the stairway on a tank where he had been taking inventory. The former safety record for the petroleum industry was 5,791,899 man hours set by the Standard of Indiana manufacturing department in 1941. The former safety record for individual refineries was 4,216,623 man hours set by the Baton Rouge, La., refinery of Standard Oil Company of Louisiana in 1940.

LeTourneau Appoints Executive Vice-President

M. M. Baker

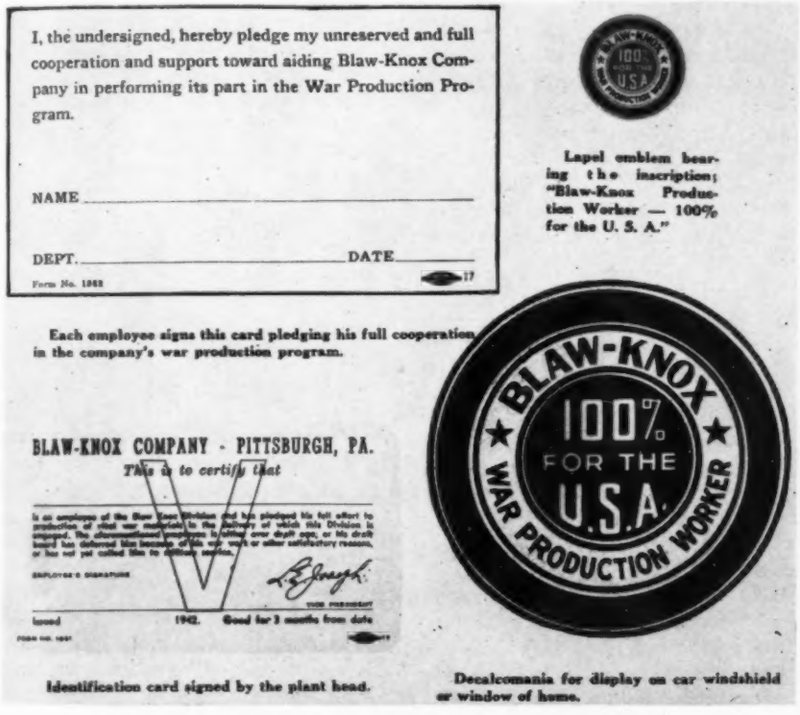
To coordinate the executive activities of the fast-growing LeTourneau company and thereby increase its effectiveness in the war effort, Murray M. Baker of Peoria, Ill., has been appointed to the newly created post of executive vice-president. Baker enters on his new duties immediately and will make his headquarters at the Peoria plant of R. G. LeTourneau, Inc. The new post was created to enable R. G. LeTourneau to devote a greater share of his time to the increased engineering activities made necessary by the war work of the company's four plants in Peoria, Ill.; Tournapull, Ga.; Vicksburg, Miss. and Stockton, Calif. Murray M. Baker has been associated with earthmoving and heavy construction equipment since 1909 when the Holt Manufacturing Co., now Caterpillar Tractor Co., first established in Peoria, Ill. His interest in LeTourneau was inspired during the early development period when carryall scrapers and "Caterpillar" tractors became prominent in the Middle West and the East Coast. When LeTourneau came to Peoria, Baker was instrumental in picking the company's present manufacturing location. He has been a director of the company for the past four years. Baker's chief job during World War I was in connection with the production of Caterpillar equipment for the Allied Governments at home and abroad and in collaboration with the Ordnance Department, of the U. S. Army in preliminary development of the tank. Interest in the Le Tourneau plant has been renewed because of Army activity in production of material for heavy war work and production of armor piercing shot under Ordnance specifications which by strange coincidence is a means for destroying tanks.

W. T. Sanford Appointed Service Manager

The Buda Co. of Harvey, Ill., has announced the appointment of Wm. T. Sanford as service manager of the Railroad Division. Mr. Sanford has had wide experience in engineering and field service. He attended Bates College, Lewiston, Me., and went through the Chrysler Engineering School and Hempville Diesel Engineering School. He has served his six years with the Hoosick Electric Specialty Co. of Hoosick Falls, New York, in engineering developing and designing of high dielectric molded material for magnetos, X-ray machines, aircraft ignitions, radios, etc He has spent 2½ years with the Chrysler Corporation, Detroit, as automotive and diesel field engineer; 2 years with Sinclair Refining Company, Chicago, as field engineer covering the State of Illinois; and 3 years with Socony-Vacuum Company, Chicago, in the same capacity.

How Blaw-Knox Employees Are Identified

Various means of identification and proof of their employment in war work are provided by Blaw-Knox Co., Pittsburgh, Pa., to all their employes. Following the making of a signed pledge by the employe, he receives a lapel emblem, a certified card of identification, and a decalcomania for display on a window of his home or on his automobile.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New Trade Literature

Asphalt Construction Specifications.—The Asphalt Institute has issued 20 newly revised asphalt construction specifications. Revision was made to incorporate: (a) present U. S. Bureau of Standards Simplified Practice relating to the gradation of aggregates; (b) the most recently developed Equipment essentials; and (c) the latest Institute recommendations, based upon a cor-relation of its laboratory studies and field engineering experience. Copies of any of these specifications are available, without charge, upon request to the Asphalt Institute, 801 Second Ave., New York, N. Y. The list of specifications follows:

A-1—Specification for Asphalt Macadam Surface Course (Penetration Method with Asphalt Cement)

A-2—Specification for Asphaltic Concrete Surface Course (Coarse Graded Aggregate Type)

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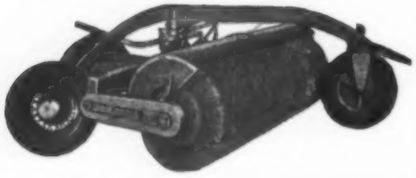

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A-4—Specification for Sheet Asphalt Binder and Surface Courses

B-6—Specification for Patching, Reducing Crown and Correcting Profile (Of Old Surfaces which are to serve as Foundations)

B-7—Specification for Asphalt Macadam Base (Penetration Method with Hot Asphalt Cement)

B-8—Specification for Asphaltic Concrete Base (Black Base) (Coarse Graded Aggregate Type)

CL-1—Specification for Cold-Laid Asphaltic Plant-Mix Surface Course (Primed Macadam Aggregate Type)

CL-2—Specification for Cold-Laid Asphaltic Plant-Mix Surface Course (Macadam Aggregate Type)

CL-3—Specification for Cold-Laid Asphaltic Plant-Mix Surface Course (Dense Graded Aggregate Type)

CL-4—Specification for Cold-Mix—Cold-Laid Emulsified Asphalt Plant-Mix Base and Surface Courses (Dense Graded Aggregate Type)

CP-1—Specification for Stock-Pile Asphalt Paving Mixtures for Making Quick Repairs of Bombed Surfaces

MP-1—Specification for Modified Penetration Emulsified Asphalt Surface Course.

RM-1—Specification for Asphaltic Road-Mix Surface Course (Macadam Aggregate Type)

RM-2—Specification for Asphaltic Road-Mix Surface Course (Dense Graded Aggregate Type)

S-1—Specification for Asphalt Surface Treatment or Retreatment of Old Bituminous Surfaces

S-2—Specification for Asphalt Surface Treatment of Waterbound Surfaces

S-3—Specification for Asphalt Surface Treatment of Loosely Bonded Surfaces

S-4—Specification for Emulsified Asphalt Surface Treatment of Old Bituminous or Other Paved Surfaces (Particularly Adapted to Smooth Texture Surfaces)

S-5—Specification for Emulsified Asphalt Single and Double Surface Treatments of Waterbound and Rough Texture Surfaces

Trencher.—With trenching machinery very much in demand nowadays for new pipe lines, drainage projects, army camps, municipal work and other ditching jobs, the Buckeye Traction Ditcher Co., Findlay, O., is particularly timely with its Model 12 Trencher Bulletin just off the press. The Model 12 has a number of special features which are fully described in the new two-color bulletin which is sized for convenience in filing and for ready reference. It is profusely illustrated. This bulletin, which covers all improvements and refinements on the Model 12, will be sent at once on request to the Buckeye Traction Ditcher Co., Findlay, O.

Spray Bar.—A bulletin has been issued illustrating and describing the Cartwright full circulating hot spray bar. This spray bar is made by the Buckeye Traction Ditcher Co., Findlay, O., under the Cartwright patents.

Soil-Cement Mixtures.—Laboratory Handbook, just issued by the Portland Cement Association, 33 West Grand Ave., Chicago, is principally devoted to the methods of making tests to insure dependable results with soil-cement mixtures. The moisture-density test, the wet-dry test, the freeze-thaw test, and compressive strength test are covered in detail. Also discussed at length are methods for identifying and classifying soils so that they can be grouped according to their common characteristics; and methods for utilizing this information in selecting samples of soil for soil-cement testing. The Handbook also covers a brief review of research on soil-cement mixtures. The Handbook is free upon application to the Association in the United States and Canada.

Highway Bases and Airport Runways.—A new book on the design and construction of bases for highways and airport runway pavements is announced by the Solvay Sales Corporation. This book, entitled "Better Bases for Better Surfaces," contains new information recently developed on design and construction of bases. It condenses information from recent reports which show the varying amounts of compaction and density necessary to assure ultimate stability of various types of graded aggregate bases. It also includes new information on methods which will both insure proper density and at the same time effect substantial savings in water and compactive effort. Other sections cover the treatment of bases for frost prevention, and specifications used in the construction of bases with various types of materials. Copies of this book may be obtained by writing directly to the Solvay Sales Corporation, 40 Rector St., New York, N. Y.

Tractor Excavating Machines.—"Let's Dig In and Win" is the title of a new bulletin featuring the use of Traxcavators for a variety of excavating jobs. Interesting action pictures show these heavy duty tractor excavating and loading machines digging and moving dirt for the construction of airports, defense plants,

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oil pipe lines, defense housing, and highways—for maintenance work on railroads, digging in clay pits, etc. Included also are mechanical views and specifications of the three models—T2, T4 and T7—and other action views showing Traxcavators digging in toughest soils, loading the excavated material directly into trucks and wagons, carrying the loads to the hauling units and to the fill—piling, casting, spreading, backfilling — one machine doing a variety of jobs. For a copy of this bulletin, write Trackson Company, Milwaukee, Wis., and ask for Bulletin A-292.

Diesels.—"Caterpillar" Diesels go to War! is the title of a new black and white booklet just off the press. Both combat and non-combat use of "Caterpillar" products are described and pictured. To obtain a copy of this publication, released by Caterpillar Tractor Co., Peoria, Ill., request Form 7610.

Tar Products.—The Republic Creosoting Co. and Reilly Tar & Chemical Co., Merchants Bank Bldg., Indianapolis, Ind., has issued a catalog listing and describing its line of products. These include Bituvia-road tar, creosoted wood blocks, creosoted flooring for bridges, traffic marking paints, creosoted yellow pine piling, creosoted bridge timbers, bituminous expansion fillers, paving pitch, waterproofing material, wood preserving material, etc., etc. Write for the catalog for complete descriptive list of coal tar products.

Roller and Bulldozer Attachments for Road Grader.—A leaflet has been issued by the Austin-Western Road Machinery Co., Aurora, Ill., illustrating and describing its roller attachment and its bulldozer attachment for its "99M" power grader. Specifications for this attachment are given.

Lock Nuts.—A comprehensive folder on An-cor-lox lock nuts has just been issued by the manufacturers, An-cor-lox Division, Laminated Shim Co., Inc., 86 Union St., Glenbrook, Conn. The An-cor-lox lock nut is self-contained, with all-metal construction, and is devised both for extreme locking security, and speed and ease in applying.

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CHAP. 3. OVERHEAD COSTS—Contractors' overheads and public overheads compared.

CHAP. 4. ENGINEERING — Data from states, cities and other sources.

CHAP. 5. RIGHT-OF-WAY—Records and discussions.

CHAP. 6. EQUIPMENT — Rental, ownership and expense schedules in full detail; followed by records of operating and maintenance costs.

CHAP. 7. LABOR — Schedules, records and comparisons of wage rates, etc.

CHAP. 8. CLEARING AND GRUBBING — Records of work by various methods.

CHAP. 9. GRADING — Records and analyses of operations with varied types of machines under various conditions.

CHAP. 10. HAULING AND HANDLING MATERIALS — Records and analyses of operations with various types of equipment.

CHAP. 11. PRODUCTION OF AGGREGATES—Data on the production of sand, gravel, and crushed stone.

CHAP. 12. UNTREATED BASES AND SURFACES—Waterbound macadam, crushed rock and gravel construction.

CHAP. 13. STABILIZATION OF BASES AND SURFACES—Stabilization with calcium chloride, portland cement, asphalt and tar.

CHAP. 14. BITUMINOUS SURFACES AND BASES—Details and analyses of costs of various types of construction.

CHAP. 15. CONCRETE SURFACES AND BASES—Details and analyses of costs of various types of construction.

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